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Zebra Technologies completes acquisition of Motorola Solutions’ enterprise business

ZEBRA TECHNOLOGIES and Motorola Solutions have announced that Zebra has completed the acquisition of Motorola Solutions’ Enterprise business for $3.45 billion in cash.

The transaction was funded with $200 million of cash on hand and $3.25 billion in new debt. As part of the sale, approximately 4,500 Motorola Solutions employees from locations throughout the world will transfer to Zebra. The combined organization has about 20,000 channel partners in more than 100 countries, and approximately 4,300 U.S. and international patents issued and pending.

“This transformative acquisition creates one company with unparalleled capabilities and leading global brands in our industry,” said Anders Gustafsson, Zebra’s chief executive officer. “Together, we can provide the building blocks of Internet of Things solutions, as customers worldwide increasingly take advantage of data analytics and mobility to improve business performance.”

Having sold the enterprise unit, Motorola Solutions will continue to focus on mission-critical communications solutions for its public safety and commercial customers.

Schneider Electric to acquire InStep Software

SCHNEIDER ELECTRIC WILL ACQUIRE InStep Software, a provider of real-time performance management and predictive asset analytics software and solutions. The transaction is expected to close in the fourth quarter of 2014, subject to customary regulatory and other conditions.

The announcement follows Schneider’s recent acquisition of Inversys, which also complements its software and process automation capabilities.

InStep provides two primary real-time performance management and predictive analytics software solutions. Its eDNA historian software collects, analyzes and reports on real-time operational and machinery sensor data. Its PRiSM predictive analytics software monitors the real-time health and performance of critical assets. The company also offers energy management software. InStep will continue to be managed by its existing executive team, adding about 70 employees to Schneider Electric’s U.S. operations.

Murata Machinery acquires Cimcorp Group

MURATA MACHINERY (Muratec) of Kyoto, Japan, has acquired all of the issued stock of Cimcorp Oy of Ulvila, Finland, from the existing shareholders, and Cimcorp and its subsidiaries have become members of the Muratec Group.

Muratec is ranked as having the fourth-highest annual sales in the world among solution providers for materials handling systems, and Cimcorp is the top supplier for intralogistics in the tire industry serving a variety of retail and distribution customers. Both Muratec and Cimcorp will continue their businesses as independent companies.

“Muratec and Cimcorp have complementary solutions and capabilities that will help us strengthen our market position,” said Martti Artama, president of Cimcorp Oy. “The acquisition combines Cimcorp’s experience and competence in robotic solutions with Muratec’s warehouse automation technology.”
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Steve Berube, senior vice president of global distribution and logistics (left) and George Tsogas, vice president of international distribution and logistics at lululemon.

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Stretching the limits at lululemon

You’ll quickly see that “flexibility” is the core theme in this month’s System Report. As we’ve been covering the last few years, the ability to design and implement a dynamic, flexible, automated distribution facility—one able to bend and respond to demand and cut freight costs—is a critical element to success in meeting the multichannel fulfillment challenge brought on by the evolution of e-commerce.

However, we may have been overlooking the importance of instilling a “culture of flexibility” inside our facilities in this process, one that fosters employee growth both inside and outside the four walls—until now, that is.

On page 18, executive editor Bob Trebilcock shares the story behind the development of lululemon athletica’s 310,000-square-foot distribution center near Columbus, Ohio, that went live last summer for e-commerce fulfillment. Creating and maintaining industry-leading, direct-to-consumer business levels was at the core of the design and location of the facility, the company’s third DC and first east of the Mississippi—a region where the company is seeing explosive growth.

The Ohio facility is the yoga wear retailer’s most ambitious foray into supply chain software and materials handling automation after practicing more conventional processes in its other facilities in the Pacific Northwest.

The team implemented a flexible automation system that relies on a warehouse management system and mobile data collection technologies with conveyor and sortation to tie together the functional areas. The idea was to increase efficiency, drive throughput and lean out processes while having the ability to flex up or down with demand.

Rather than implement a high level of automation, we have a system and processes that allow us to bypass the automation altogether if we get an urgent order for a store,” says George Tsogas, vice president of international distribution and logistics.

At the end of the line, the team installed automatic weighing, labeling and bagging technology to streamline packing and shipping. With this efficiency plus the location in Ohio, lululemon product is now a one-day drive from 65% of the U.S. population and can service 85% of its stores and customers in two days, greatly reducing freight costs.

“This is a perfect example of a trend we’re seeing more and more,” says Trebilcock. “This is an enlightened retailer implementing distribution solutions driven by the need to be ever more responsive to customers both inside the store and direct to the customer’s door.”

But the most intriguing part of this story is how lululemon’s culture makes a tangible difference in its operations. They don’t just talk it, they practice it. “Culture is the epicenter of who we are,” Steve Berube, the company’s senior vice president of global distribution and logistics tells Trebilcock. “And, one of the ways we build strong teams in our DCs is to sweat together.”

Indeed, yoga and exercise classes are offered every day at the facility in an effort to help employees live happy, healthy, fun lives—the core of lululemon’s overall mission. “A big part of that culture is having fun together as a team,” adds Trebilcock. “Looking at the photos of lululemon associates, I noticed they were all smiling, even as they did mundane tasks like picking and packing. I always wonder why more companies aren’t focused on their culture and not just their metrics.”
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A NEARLY TWO-YEAR UPWARD TREND in the manufacturing sector experienced a hiccup according to the quarterly MAPI Foundation Business Outlook as the composite index slipped from 71 to 67 in the third quarter.

The survey’s composite index is a leading indicator for the manufacturing sector and is conducted by the MAPI Foundation, the research affiliate of the Manufacturers Alliance for Productivity and Innovation.

October’s index ended a run of six quarters of incremental improvement. Still, it marked the 20th-consecutive quarter the index has remained above the threshold of 50, the dividing line separating contraction and expansion.

In a recent interview, Donald Norman, MAPI Foundation director of economic studies and survey coordinator, said the first quarter of 2014 had not been all that strong, but most indicators showed a particularly strong second quarter.

“Month to month, we’re still going to see stop-and-go activity,” he said. “It’s just not all that smooth, and that’s been a characteristic for a while. But the results still point to continued new growth, albeit at a modest rate.”

The survey results and the index are based on objective order volumes, but Norman also includes some qualitative questions as a supplement to the survey. This year he asked about global risks, a topic with no shortage of headlines this year.

The region where respondents reported the greatest risk to operations is Ukraine and Russia. Other issues posing at least a slight risk to companies relate to Israel/Palestine, ISIS in Iraq, Syria, Ebola and terrorism in Africa, the military coup in Thailand, and the China/Japan island disputes.

“I think with all the news that’s happened over the last few months, we’re in a period in which lots of risks that weren’t apparent before are making themselves known,” Norman said. “About 65% said they are working to minimize ‘trapped’ cash and half are concerned with providing enhanced security for employees throughout the world. The survey response shows that companies are focused on those things, which are much more present in their minds.”
MANUFACTURING

MHI forecasts growth of 8% to 9% for 2014 and 2015

Materials handling equipment new orders grew 8.8% in 2013 and are forecasted to grow 8% to 9% for 2014 and 2015, according to the latest “Material Handling Equipment Manufacturing Forecast” (MHEM) released by MHI.

“We are optimistic about future outcomes and expect economic fundamentals to favorably support MHEM expansion through 2014 and 2015,” said Hal Vandiver, MHI executive consultant.

In addition, materials handling equipment shipments grew 7.8% in 2013 and are forecasted to grow 4.5% to 5% in 2014 and 9% to 11% in 2015. Domestic demand (shipments plus imports less exports) grew 8.3% in 2013 and are forecasted to grow just over 4.5% to 6% in 2014 and 11% in 2015.

Import growth in 2013 was 3.9%, down from 17.9% in 2012. Export growth was flat in 2013, down from 12.4% in 2012. MHEM imports are forecasted to grow 6% in 2014 and 9% in 2015. Exports are expected to rebound modestly beginning mid-2014 to grow 4% and continue to grow in 2015 around 6%.

The MHEM forecast of materials handling equipment manufacturing is released each quarter by MHI and looks 12 to 18 months forward to anticipate changes in the materials handling and logistics marketplace.

E-COMMERCE

New Sealed Air survey addresses packaging in e-commerce

WITH CONTINUED GROWTH in e-commerce, retailers need to take a closer look at their packaging for filling online orders, according to new data from the Sealed Air “2014 Packaging for e-Commerce Success” survey.

Conducted online by Harris Poll on behalf of Sealed Air, the survey was fielded in August among more than 2,000 U.S. adults (aged 18+). The survey indicates that still 58% of respondents say that if they receive a damaged or broken product from an online order, they would either consider purchasing from a competitor or would not purchase from that retailer again.

And 78% of respondents think their orders should be packaged and processed for shipment within 24 hours after their online purchase. The average amount of time respondents think is acceptable for processing an online order for shipment is 23 hours.

Nearly seven in 10 respondents say they are more conscious of packaging materials and design today than they were five years ago, and environmentally friendly packaging has been in the forefront of many consumers’ minds. According to the survey findings, 94% of respondents believe that there are environmentally friendly packaging solutions, and 77% say that a company’s packaging should reflect their environmental values.

Consumers have varying views on what constitutes environmentally friendly packaging. More than three quarters (78%) say it can be easily recycled or made from recycled materials (75%); 63% believe it can be reused for other shipments; 55% say it biodegrades or composts; and 31% believe it prevents them from having to return a damaged product.

ROBOTICS

North American robotics market sets new records for first nine months of 2014

ROBOT ORDERS and shipments in North America set new records in the first nine months of 2014, according to the Robotic Industries Association (RIA), the industry’s trade group.

A total of 21,235 robots valued at $1.2 billion were ordered from North American companies in the first nine months of 2014, an increase of 35% in units and 22% in dollars over the
same period in 2013.

Robot shipments to North American customers through September totaled 18,490 robots valued at $1.1 billion, breaking the previous record set in 2013 by 5% in units and 2% in dollars.

Sales activity continued to be especially strong in the automotive industry, with orders up 48% year to date over 2013. Non-automotive industries, such as electronics, food, consumer goods and metals also posted double-digit growth in the first nine months of the year.

“The robotics industry in North America is having its best year ever in 2014,” said Jeff Burnstein, president of RIA. “Along with record performance, we are seeing more interest in robotics and related technologies than ever before. It’s also interesting to note that as robot sales boom, U.S. unemployment continues to fall and is currently at its lowest level since July of 2008, further evidence that robotics helps save and create jobs.”

In terms of growth within specific applications, spot welding (76%), arc welding (39%), and assembly (29%) applications have recorded the highest year-over-year growth through September. RIA estimates that some 230,000 robots are now in use in United States factories, placing the United States second only to Japan in robot use.

Automate 2015, the industry’s leading event, takes place March 23 to 26, 2015 (co-located with ProMat 2015 at McCormick Place in Chicago). With four months still to go, the exhibit floor at Automate 2015 is already more than 40% larger than the 2013 event, Burnstein said.
“Pack Expo International 2014 was definitely a success,” said Jim Pittas, senior vice president, PMMI, “Exhibitors sold machines right off the show floor and collected high-quality leads from the steady flow of attendees.” Pre-show registration was well ahead of 2012 figures and that momentum continued on site. Pharma Expo, which PMMI produced in partnership with the International Society for Pharmaceutical Engineering (ISPE), clearly contributed to the surge in attendance, with twice as many attendees identifying their primary or secondary markets as “pharmaceutical.”

Pittas noted the successes of Pharma Expo and Pack Expo 2014 strengthened the groundwork for excellent results for exhibitors at upcoming Pack Expo trade shows including Pack Expo East in February and Pharma Expo and Pack Expo Las Vegas 2015.

“Exhibitors begin planning their strategy for the next Pack Expo almost immediately after the close of the previous year’s show, and they need to know they’ll get a strong return on their investment,” says Pittas. “The success of the inaugural Pharma Expo proves the strength of the Pack Expo brand across all vertical markets and reinforces the industry’s view of Pack Expo as the preeminent North American packaging and processing show.”

Coming in February, PMMI brings the strength of Pack Expo to the East Coast with Pack Expo East (Feb. 16–18, 2015; Pennsylvania Convention Center, Philadelphia).

State of industry released: U.S. packaging machinery shipments increased by 6%, to $7.9 billion, in 2013, and a rise in retail-ready packaging (RRP) is changing the role of secondary packaging, according to PMMI.

PMMI released the findings of its “2014 State of the Industry: Packaging Machinery Shipments Study (SOTI)” and “2014 Secondary Packaging Market Research Study” at Pack Expo at a press briefing. PMMI member packaging machinery manufacturers provided data for their 2012 and 2013 shipments for this study. Total U.S. packaging machinery shipment estimates also incorporated projected non-member shipments.

“Total U.S. consumption—an overall figure that includes imports, exports and domestic shipments—reached $9 billion in 2013,” said Jorge Izquierdo, vice president of market development for PMMI. “Foods and beverages together continue to account for more...
than half of the shipments. This is consistent with what we’ve seen over the past 10 years.”

While SOTI illustrated a consistent overall market, PMMI’s “2014 Secondary Packaging Market Research Study” revealed a dynamic industry segment feeling the strength of consumer trends.

“In 2008, when we last conducted this survey, every company we spoke to said they were trying to reduce costs and improve their sustainability ratings in secondary packaging, and retailers demanded those changes because of consumer preferences. In contrast, roughly half of the 2014 study participants say they’ve implemented those changes and are satisfied with the results,” Izquierdo said.

One of the most visible trends for secondary packaging, however, is its role as a retail-ready packaging medium. Izquierdo added, “Retailers are asking for more shelf display containers and as a result, we’re seeing secondary packaging going directly from pallet to store shelf.”

Changes in primary packaging are also driving shifts in secondary packaging, the report notes. Food (45%) and beverage (50%) producers noted changes such as switching flexible packaging and lightweighting primary packaging are resulting in the need for stronger support from secondary packaging.

The 2014 study also shows decrease usage in corrugated fiberboard materials and an increase in the use of recycled material content, overwrapped trays and shrink-wrapped pads.

Also in Pack Expo news: Rutgers University took first prize in PACK Solutions Challenge presented by the PMMI Foundation and sponsored by B&R Industrial Automation. Clemson University finished second and University of Wisconsin, Stout, earned third prize. The team from Rutgers University included Miles Borgeson, An Cierpial, William Kim and Melissa Lekulitch. Team members will share $4,000 in scholarship funds.

The PACK Solutions Challenge is an annual student contest where teams from PMMI Partner Schools research and develop a real-world packaging solution. For this year’s challenge, the fictional “Ray’s Premium Pet Food Company,” requested proposals for a dedicated line to package and ship its new retail-ready line of all-beef jerky treats. The students began their research online and followed up with exhibitors. 

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Barriers to entry

Generic regulations and misused solutions often undermine effective practices for keeping lift trucks away from people, product and problems.

By Josh Bond, Associate Editor

Standards and regulations are designed to provide a basic level of safety inside industrial facilities. But because many are vaguely worded, proper safeguarding of people and equipment often falls short of the intended goal. Tasked with separating multi-ton equipment from people, structures and drops, lift truck barriers require some of the most extreme performance among industrial safety solutions. Yet, they are also among the least understood.

“Just because it’s yellow and metal, doesn’t mean it’s providing any protection,” says Brian Hrabec, general manager of A-Safe. “Then again, an OSHA regulation calling for ‘separate areas and paths for people and equipment’ could be interpreted as a green painted line, so I suppose a yellow bollard is better than nothing.”

The problem is when a bollard expected to stop a lift truck proves about as effective as a strip of paint. It all comes down to physics, Hrabec says. One product might be rated to withstand a 90-degree impact from a 10,000-pound lift truck at 3 miles per hour. If the equipment is any larger, or smaller but traveling faster, that’s a problem—and designing a bollard to handle an extra ton or two can be exponentially more expensive. And, that is assuming a barrier’s rating is even known.

After an impact, aside from damage to the equipment, there are more costs as the barrier and, in many cases, the floor need to be replaced or repaired. These costs are preferable to an injury, but a well-designed barrier can provide benefits even when never touched.

“Barriers can be used to help design the traffic flow of lift trucks and employees through a facility,” Hrabec says. “Certain patterns can help save time if they enable the fastest route from point A to point B.”

Conversely, traffic also informs barrier design, such as the use of a steel bollard in a low-traffic area or a flexible polymer barrier in an environment prone to impacts. A new set of considerations emerges in cold storage facilities, where the behavior of polymers and concrete is again subject to physics.

Unpainted polymer barriers are often used in food-safe and cold applications because of their ability to transfer only 20% of an impact’s force into the anchor and the more brittle concrete floor. Space is at a premium, especially in cold storage, but whether it’s -40°F or 120°F the right barrier can prove a worthwhile investment.

Josh Bond is Modern’s associate editor and can be reached at jbond@peerlessmedia.com
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When an automotive manufacturer asked Creative Techniques to develop a new way to secure pallet loads of tray-, tote- and dunnage-packed components without stretchwrap or banding, the company saw an opportunity to introduce a new standard product: the enviroLid.

Made of structural foam plastic, the heavy-duty, 45 x 48-inch lid sits atop a pallet load of totes or trays. The lid’s recessed, seatbelt-style mechanisms—each with a metal hook to grip the pallet’s edge—incorporate a positive engaging ratchet mechanism. The device creates tension that securely sandwiches the load between the pallet and the lid; when removed, the spring-loaded belts retract automatically.

“The hooks can be custom designed to match any pallet, including injection molded, structural foam, thermoformed, metal or wood,” says Rick Parker, Creative Techniques’ vice president of business development.

Known for designing and manufacturing custom-engineered, reusable packaging for closed-loop supply chains (typically between manufacturers and components suppliers), Parker and his team knew the enviroLid had the potential for broader applications.

“Benefits include better sustainability by eliminating stretchwrap or banding—plus improved safety for both personnel and product by eliminating razor knives,” says Rick Parker, Creative Techniques’ vice president of business development.

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“Benefits include better sustainability by eliminating stretchwrap or banding—plus improved safety for both personnel and product by eliminating razor knives,” says Rick Parker, Creative Techniques’ vice president of business development.

The original lid, introduced four years ago, was engineered to secure heavy components like transmission and engine parts, says Parker. “Because those pallets can contain 3,000-pound loads stacked up to four-high, the lid had to be extra robust.”

Because not every application calls for such sturdiness, the company recently unveiled an injection-molded plastic enviroLid for 2,500-pound loads. “It has the same dimension and features, but weighs 22 pounds, so a single person can handle it,” he says.

The company also offers an injection-molded enviroLid and pallet combination with a 32 x 36-inch footprint. “It’s a unique size that works well for smaller batch component deliveries to assembly lines by tuggers pulling carts,” Parker says. “With more operations looking to eliminate forklifts, this was the best size to interface with carts and pallet jacks.”

Sara Pearson Specter is an editor at large with Modern and can be reached at sara@saraspecter.com.
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Sweating the details at lululemon’s Ohio DC

The yoga wear retailer’s new multichannel DC is speeding up time to market, streamlining e-commerce processes and reducing freight costs. Flexible automation is the key.

By Bob Trebilcock, Executive Editor

ou've heard the old line “never let 'em see you sweat,” right? Well, lululemon athletica, a company famous for its technical athletic apparel, including its signature yoga pants, has turned sweat into a business, according to Steve Berube, the company’s senior vice president of global distribution and logistics, and George Tsogas, vice president of international distribution and logistics.

The company manifesto, familiar to every employee, is a collection of ever-evolving statements and slogans intended to spark conversation, including: “Sweat Once A Day,” “Breathe
Deeply,” and “Drink Fresh Water. And, as much water as you can.” “The company purpose,” says Berube, “is to elevate the world from mediocrity to greatness through a mission to have our products create transformational experiences for people to live happy, healthy, fun lives. As a company, we want to elevate the world by helping people set goals from a personal, career and health standpoint.” And, it starts with their own people.

Staff goals are posted for all to see in a new 310,000-square-foot distribution center near Columbus, Ohio, that went live last summer for e-commerce fulfillment. Store fulfillment and replenishment are scheduled to go live in 2015. Working with a systems integrator (SDI, sdigroupusa.com), the facility introduced supply chain technologies and materials handling automation to a company that had largely relied on conventional distribution in its other North American facility in the Pacific Northwest. The technologies include:

- A warehouse management system (WMS) and warehouse control system (WCS) create pick waves and orchestrate order fulfillment operations;
- RF, voice and put-to-light technologies direct putaway,
picking and replenishment processes;
• Conveyor and sortation route orders through the facility; and
• Automatic weighing, labeling and bagging technologies streamline packing and shipping.

As with yoga, which is at the heart of the company, flexibility is also an important component of the design. “Rather than implement a high level of automation, we have a system and processes that allow us to bypass the automation all together if we get an urgent order for a store,” says Tsogas. He adds that the facility was designed to grow with the business, including the ability to expand from the current 7,000 stock keeping units (SKUs) to 20,000 SKUs.

A culture of sweating together
It’s difficult to write about lululemon without writing about a unique culture that values letting ’em see you sweat. “Culture is the epicenter of who we are,” Berube explains. “And, one of the ways we build strong teams in our DCs is to sweat together.”

The company was founded in 1998 after Chip Wilson, a 20-year veteran of the surf, skate and snowboard business, took the first commercial yoga class offered in Vancouver, British Columbia. Exhilarated, Wilson was convinced that the time had come for yoga. He began to design technical and beautiful athletic fabrics that people could feel comfortable sweating in. That vision continues today. “One of the technologies we talk about is our anti-stink materials,” says Tsogas. “You can work out in one of our shirts today, and feel great wearing it again the next day.”

The first lululemon store opened in the Kitsilano beach area of Vancouver in 2000. The idea was to create more than just a store, but a community hub where people could learn and discuss the physical aspects of healthy living from yoga and nutrition to running and cycling. Nine years later, lululemon launched the iviva athletica line for young girls. As of the second quarter of 2014, the company was operating 270 stores and continues to be a growth company.

Despite its impressive growth, sweat remains at its core. For instance, the new distribution center features a fully equipped 3,000-square-foot gym and a 1,500-square-foot yoga space. Personal trainers offer classes to associates on a daily basis.

“It’s common to see a boot camp workout with 50 or 60 co-workers in the parking lot or on the DC floor,” says Berube. “On your first day, you have to get out in front of your teammates to introduce yourself, share a one-year goal and show off your favorite dance move. Our goal is to elevate the world by creating lead-
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ers and building authentic relationships inside and outside our business.”

That sense of mission extends to distribution and logistics. “We’re a global engine reinventing our industry by putting people first, having fun and delivering exceptional service,” Tsogas explains. “If we do that while elevating lives and setting up an inspirational culture, we will deliver the best service in our industry.”

**Designing for service and growth**

Industry-leading service was one of the tenants behind the design and location of lululemon’s Ohio facility, the company’s third DC in North America; the network already counted a facility in Vancouver that services Canada and a facility in Washington that previously served the United States.

The project was initiated in 2012 with a network analysis performed by FedEx. In recent years, the company had seen a significant growth in its e-commerce business as well as a growth of its customer base east of the Mississippi. In addition to the increased transportation costs associated with growth on the East Coast, service times were suboptimal, with an average transit time to stores and guests, as lululemon refers to its customers, of 3.72 days.

“By opening a second United States DC in Ohio, we’re a one-day drive from 65% of the U.S. population, and we can service 85% of our stores and guests within two days,” says Tsogas, who adds that stores are replenished five days a week. In fact, the new facility has reduced average transit times to 1.92 days.

In addition to service, at least four other factors came into play, including:

1. **Business continuity and risk management:** If the DC in Washington went down, the network would have been challenged to service U.S. stores and customers. Now, there is an alternative.

2. **Capacity constraints:** A two-facility model provides capacity for the next five years and the Columbus property has room to expand by 150,000 square feet.

3. **Freight costs:** Locating a distribution center in the Midwest reduces freight costs to stores and guests on the East Coast, Southeast and Midwest.

4. **Laboratory for innovation:** The Columbus DC serves as a lab, where innovation can be tested and then rolled out to other facilities, including third-party logistics (3PLs) providers in Hong Kong and Europe, and a DC in Australia.

**Flexible automation**

When it came to designing the materials handling systems and processes, the final design was chosen from about 12 different layouts and configurations suggested by the system integrator. For every potential solution, the whole distribution team was involved in the evaluation. The project’s steering committee included the chief information officer, the head of e-commerce and representatives from planning, allocations and finance.

In the end, lululemon opted for flexible automation. Instead of an automated storage and retrieval system (AS/RS) and goods-to-person picking station, the facility relies on its WMS and mobile data collection technologies along with conveyor and sortation to tie together functional areas. The idea is to increase efficiency, drive throughput and lean out processes while maintaining the ability to flex up or down to meet demand, which can vary from 5,000 to more than 12,000 orders a day, or to fill a hot order for a store.

“In the future, guests may want premium packaging or something unique with a garment during seasonal periods,” says Berube. “We may need to isolate a store that is having exceptional sales, or rework a SKU with new pricing and hang tags. Those couldn’t be done as easily if we were using an AS/RS.”

The key technology is the WMS, which determines the most efficient way to batch single line orders—now 50% of order volume—to an autobagger, multi-line orders to manual pack stations, and store replenishment activities that are scheduled to come online soon to create a true multichannel environment. The WMS is complemented by three data collection technologies that are deployed to optimize various processes:

- RF, mobile computing and barcode scanning direct inbound receiving, putaway, full carton picks and replenishment of pick faces.
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Embracing automation for e-commerce fulfillment

WMS, lights, voice and conveyors bring a new level of efficiency to lululemon athletica’s Ohio distribution center.

The yoga wear retailer’s new 310,000-square-foot distribution center near Columbus, Ohio, is a testing ground for automation. The system features a combination of conveyor, sortation, put-to-light and voice technology, all directed by a warehouse management system (WMS).

Receiving: Receiving is initiated when advanced ship notifications are fed into the WMS. Newly received product is unloaded to an extendable conveyor and delivered to the receiving area (1). When the cartons are scanned, the WMS directs the receiver to sort the merchandise by the next task and distribution channel. Next task, for example, includes merchandise that might require dimensional scanning, quality assurance or a value-added service before putaway. Similarly, the product may be staged for storage in a pallet racking area (2) or a carton rack area (3). Once product is ready for putaway, the WMS directs a wire-guided lift truck operator to the right storage location. The operator scans a location to confirm putaway.

Replenishment: Wire-guided lift truck operators are directed by the WMS to pull merchandise from reserve stock locations (2,3). Those items are right at the new facility. In large part, that’s because 50% of the management team in Columbus came from the Washington facility; they understood and taught the values, and they recruited local talent that perfectly complements the team.

“We’re proud of the team we have in place. How we coach and mentor our people is ingrained in who we are and what makes us unique,” says Berube. “We authentically care about the lives our people, and it’s paid back many times. That’s just who we are.”

 Associates prepare to replenish pick faces in the carton picking area.
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- Handling & Warehouse Ergonomics
- Packaging
- Software & Technology
then delivered to a pick location in the active carton (4) and active pallet picking areas (5). Pick locations are confirmed by a bar code scan.

**E-commerce picking, packing and shipping:** The WMS creates picking waves for single line and multi-line orders. Voice technology directs order selectors in the active pick shelving area (4). Single line orders are picked into a large tote that consolidates up to 35 orders per tote; multi-line orders are picked to a cart that holds up to 16 smaller totes in a single pass through a picking area. Once a tote is complete, the order selector inducts the tote onto the e-commerce packing induction conveyor (6). Following an automatic scan, the WCS diverts totes to the appropriate lane in the packing area (7) for that order: Single line orders are packed using an autobagger; multi-line orders are packed manually.

Once packing is complete, an operator inducts a package onto the carton sortation conveyor. The sorter diverts the package to the right shipping lane (8) for that order. Once the truck is picked up by FedEx, the order is closed out in the WMS. That information is then fed to the order management system, which triggers payment confirmation and sends a shipment notification to the customer.

**Store picking, packing and shipping:** Stores receive two types of deliveries: new styles that are allocated to the stores and replenishment orders of existing styles. Each delivery type has its own picking, packing and shipping process. It’s important to note that over 99% of orders are re-packs and new styles are delivered to the stores weekly.

**New SKUs:** Orders for new styles are fed into the WMS, which creates a picking wave. These can include full cartons and mixed cartons. Full cartons are picked in the carton rack storage area (3). There associates operating wire-guided lift trucks are directed by the WMS to a pick location, which is confirmed by scanning. Full pallets are delivered to the shipping area (8).

Mixed cartons orders are picked in a put-to-light area (9). The WMS sends carton information to an associate who inducts the right carton for an order onto the carton sortation conveyor. The WCS diverts the carton to the corresponding put-to-light lane. When the carton arrives in the zone, the carton label is automatically scanned. The bins with items for that carton are illuminated, along with the number of items to be picked. Once the associate packs the carton, it is inducted back onto the carton sortation conveyor. Following another automatic scan, the carton is conveyed to an inline scale where the weight is recorded and sent to the WMS. The WMS determines the best way to ship the carton and creates a shipping label, which is automatically applied. The sorter then diverts the car-
System suppliers

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MDR CONVEYOR: Hilmot, hilmot.com
BELTED CURVES: Transnorm, transnorm.com
EXTENDABLE CONVEYORS: Best Conveyors, bestconv.com
WMS: Manhattan Associates, manh.com
MOBILE COMPUTING AND SCANNING: Motorola Solutions, motorolasolutions.com
LABEL PRINTING: Zebra Technologies, zebra.com
CASE SCANNERS: SICK, sickusa.com
MEZZANINE: Steele Solutions, steellesolutions.com
VOICE RECOGNITION: Vocollect, vocollect.com
CARTON AND PALLET RACK AND SHELVING: Steel King Industries, steelking.com
INLINE SCALE: OCS Technologies, ocscal.com
DIMENSIONAL CUBING: CubiScan, cubiscan.com
E-COMMERCE AUTOBAGGER: Sharp Packaging Systems, sharppackaging.com
LIFT TRUCKS AND ORDER PICKERS: Raymond Corp., raymondcorp.com
NETWORK DESIGN STUDY: FedEx, fedex.com

Existing SKUs: Before picking for existing styles is initiated, merchandise is pulled from the carton rack storage (3) and moved to carton flowing located in the active carton picking area (4). Associates are directed by the WMS to pick replenishment stock to a wire-guided lift. That inventory is then delivered to a pick location in the carton flow rack and confirmed by scanning a location label.

Once the carton flow rack area is stocked, pick waves are created in the WMS. Associates are directed by voice to pick to carts. Each associate can pick up to 12 cartons/orders in a single pass through the pick zone. Once all of the items have been picked, the associate inducts the cartons onto the carton sortation conveyor. As new items, cartons are automatically weighed and a shipping label is created and automatically applied before cartons are sorted to the right shipping lane (8).

In both instances, the load is closed in the WMS when the carrier picks up an order. The information is fed to the enterprise resource planning (ERP) system, which triggers a store shipment notification.

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The legacy warehouse management system (WMS) is powerful and essential, but it has its strengths and limitations. A traditional WMS offers strengths in planning and inventory management, but its weaknesses—a focus on daily, sequential, waterfall-style task assignment—have proven to be a crippling shortcoming amid the e-commerce boom and the demand for rapid execution of increasingly complicated orders. A growing trend suggests operations looking for an intermediate or alternative approach to a new or upgraded WMS have some options, including warehouse control systems (WCS) and voice solutions.

“A lot of companies we run into every day have a legacy WMS that is not as functional as it needs to be,” says Ian Hobkirk, founder and managing director of Commonwealth Supply Chain Advisors. “It’s extremely common, with probably 40% to 50% of customers in this situation to some extent.”

Hobkirk emphasizes that voice systems and WCS have their own sets of strengths and weaknesses, and are not a WMS replacement, but a complement. “If you have one or two needs

Complemented by a growing stable of inexpensive execution solutions, aging software monoliths can prove they don’t need to be toppled.

By Josh Bond, Associate Editor

The near future of a legacy WMS

Reasons companies avoid replacing/upgrading WMS (% of respondents)

<table>
<thead>
<tr>
<th>Reason</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear of a “bad” implementation</td>
<td>44%</td>
</tr>
<tr>
<td>Minimal perceived benefit</td>
<td>28%</td>
</tr>
<tr>
<td>Cost</td>
<td>28%</td>
</tr>
</tbody>
</table>

Source: Commonwealth Supply Chain Advisors, 2014

THE BIG PICTURE
that play to strengths of WCS and voice, great,” he says. “If you have half a dozen needs across the operation, look at a new WMS.”

If done right, the addition of voice and/or WCS can make a later WMS upgrade much less disruptive. “If you deploy voice right now in a legacy WMS and keep it doing what it’s good at, you can keep voice when you update,” Hobkirk says. “But if you stretch voice or WCS to things not in its wheel house, you might throw away a lot of that development.”

For many, the pace of change in the software market is shocking and certainly bears no resemblance to the historical 10- to 25-year lifespan of monolithic software systems. “In all my years, I’ve never seen so rapid a change,” says 30-year industry veteran Greg Cronin, executive vice president at Intelligrated. “Software used to

E-commerce demands real-time responsiveness to single-line orders, challenging legacy systems geared toward daily cycles and case quantities.

### Functionality drivers by WMS maturity level

<table>
<thead>
<tr>
<th>Class A</th>
<th>Companies that already have a moderately robust WMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voice directed warehousing</td>
</tr>
<tr>
<td>2</td>
<td>Slotting</td>
</tr>
<tr>
<td>3</td>
<td>Labor management</td>
</tr>
<tr>
<td>4</td>
<td>More sophisticated pick process</td>
</tr>
<tr>
<td>5</td>
<td>Pick wave planning</td>
</tr>
<tr>
<td>6</td>
<td>Lot control issues</td>
</tr>
<tr>
<td>7</td>
<td>Task interleaving</td>
</tr>
<tr>
<td>8</td>
<td>Cartonization</td>
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</table>

<table>
<thead>
<tr>
<th>Class B</th>
<th>Companies that have little or no WMS capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Real-time transaction confirmation</td>
</tr>
<tr>
<td>2</td>
<td>More sophisticated pick processes</td>
</tr>
<tr>
<td>3</td>
<td>Directed put-away</td>
</tr>
<tr>
<td>4</td>
<td>Receiving improvements</td>
</tr>
<tr>
<td>5</td>
<td>Slotting</td>
</tr>
<tr>
<td>6</td>
<td>Improvement integration to MHE</td>
</tr>
</tbody>
</table>

Source: Commonwealth Supply Chain Advisors, 2014
be on a five- or eight-year cycle. Now it’s closer to three. Everything is speed and satisfying consumer demand.”

The legacy of WMS

Ten to 20 years ago, systems were designed around cases and pallets. If the WMS did not have the data needed to support less-than-case quantities, it might be too difficult an engineering effort to add that capability. “It leads to dysfunctions, and some end up creating separate businesses,” says Curt Sardeson, managing principal at Open Sky Group. “If you’re operating one facility with two WMS solutions, you probably have a problem.”

Even if there are not yet functional problems, Hobkirk says there are some telltale signs they’re not far away. “If a system is not supported by the original developer, if it’s entirely homegrown, or if it’s in an outdated code base that will make it hard to find support with that expertise, you will have difficulties,” he says. “Then again, it can be as simple as an old system’s inability to recognize more than a single forward pick location for a given SKU.”

Historically, a WMS assigns a single pick location per SKU. This can create significant congestion as pickers try to access fast-moving SKUs. The seemingly simple act of distributing A-movers to several areas can challenge legacy systems. And, then there’s the complexity of integrating a legacy WMS with one or more automation subsystems.

As automation has migrated into the fulfillment space—Cronin says it has almost become a requisite for companies starting at 15,000 orders per day—WCS evolved as a real-time intermediary between the WMS or system of record and the dynamic needs of the facility. The hope when investing in a carousel, automated storage and retrieval system (AS/RS), pick-to-light system, automatic guided vehicle (AGV) or A-frame is that speed and efficiency will follow. But a legacy WMS geared toward daily cycles will struggle to keep up with the real-time capabilities of automation.

Lance Anderson, vice president of sales for Invata Intralogistics, explains the importance of effective communication between the two.

“The WMS sends the carousel all the orders it wants to process for the day. Now, say the WMS didn’t know a sale was coming, and had populated the day’s replenishment based on historic algorithms. When orders come in, items are not in the carousel and you have to scrap the whole order and start over,” Anderson says. “Once the WMS batched at night and moved inventory to the forward pick area, you need to execute the order however it’s laid out.”

If a WCS has the authority to move inventory around, reroute orders, and

Voice can isolate associates from changes in software systems by preserving a familiar interface during upgrades.
make changes in the middle of the batching process, it can work to get orders out the door. It might also have access to the labor pool to reallocate accordingly. At that point, Anderson suggests an operation is less concerned with cost per piece than with filling the order. “Batch- and wave-based WMS algorithms are based on the lowest cost,” he says. “With e-commerce, if I tell my boss 80% got out efficiently but 20% didn’t get out at all, do you think he cares about the 80%?”

Instead, every time a WCS assigns the next work task to replenishment, picking or packing, it will run the algorithm again. What is the state of the operation right now? Is the pack line down? Is a print head down? What is the state of labor? Who didn’t come back from lunch? At that moment it makes the best decision on what to do next, and updates the WMS accordingly.

Mission: control
But suppliers emphasize that WCS is more than “middleware” (which has almost become a dirty word) or something only intended to orchestrate automation. By taking control of fulfillment and working toward optimum productivity, WCS has become proficient in

A legacy WMS should focus on what it does best: planning. Voice and warehouse control systems can handle the execution.

Distributor of education supplies passes inventory exam
ASSET STEM Education is a distributor of professional development to educators, specializing in the kitting, delivery and management of hands-on curricula and leased supplies. Reverse logistics and quality control are essential to the company, which often receives returned kits with missing, damaged or extraneous items. After deploying a series of custom software applications, the company was able to manage inventory on an item-level—rather than kit-level—basis.

The company operates a 20,000-square-foot warehouse on the south side of Pittsburgh. Its 3,000 SKUs include equipment and consumables for science, technology, engineering and math (STEM) lessons. SKUs are assembled into at least 100 different modules, with 12 lessons in each unit.

“We don’t want teachers to have to shop for supplies, so we provide everything they need,” says Cynthia Pulkowski, executive director of ASSET STEM Education. “But if one item is missing or damaged, they have to make a trip to the store, and we’ve missed that goal.”

Previously, the system assumed that if a kit came back it did so with all components intact. Because that was rarely the case, an accurate inventory count was impossible. Associates often borrowed from one module to complete another.

“It created a nightmare,” says Frank Arzenti, director of materials support center. “It was frustrating because we considered continuing to use our existing WMS or look at a new one, which probably would be too costly and big for what we need.”

A custom-engineered assortment of functional “apps” (DMLlogic, dmllogicllc.com) now works with the existing system to provide item-level tracking and management of workflows in returns, picking and packing. The company executed the changeover to the new apps without any shutdown, while working to add all inventory to the system.

When orders are released to the floor, it creates a unique license plate for specific totes, each representing a module or portion thereof. One person can now pick to six totes at the same time, instead of six people picking to one module each. Last year the company shipped about 10,000 totes containing a total of 3.6 million eaches.

The project reduced space needed for materials, so last year the company was able to give 10,000 square feet back to the landlord while also bringing materials back in-house from off-site storage. After reconfiguring the warehouse to store components instead of pallets of totes, it went from 1,000 linear feet of storage to 4,000 linear feet without breaking a wall.

“Item level has been tremendous improvement to inventory,” Pulkowski says. “One of the most important things was that the supplier always listened to the staff as they were developing. They never just gave us something and said, ‘use this.’ It was what we asked for and they checked at every step of the way.”
fulfillment execution, or the real-time direction of automation and labor in sync with incoming orders. That said, some call the WCS market a "Wild West" characterized by proliferating acronyms, customer confusion and a growing number of solutions to problems they only recently learned they had.

To simplify things, Jerry List, vice president of QC Software, describes three basic tiers of WCS. The Tier 3 WCS involves a more traditional interface with materials handling equipment. Tier 2 gets into order fulfillment, not necessarily using automation, and might coordinate picking and packing functions. A Tier 1 WCS is one that begins to overlap into the WMS space, offering more dynamic inventory control and management.

The goal at any tier, List says, is a good understanding of an important formula: productivity equals efficiency times percent utilization. "A lot of people use the words 'productivity' and 'efficiency' interchangeably, but they're not the same," he says. "If a voice-enabled picker has to wait a few seconds for a tote to arrive, that's zero utilization. He's efficient, but not necessarily productive. The only way to improve is with a real-time execution system."

Voice is among the many solutions for the increased amount of each picking, and enjoyed a warm welcome in the execution software environment. "The software foundation in the WCS was already there," says Ken Ruehrdanz, manager, distribution systems market for Dematic. "WCS systems had been directing warehouse activities using pick-to-light and put-to-light technology for perhaps 20 years prior to the arrival of voice. Many legacy WMS do not accommodate voice, while many legacy WCS software modules do. Because of this early start, WCS software has expanded the functionality and performance that voice technology can provide in warehousing applications."

Still, there is no hard and fast rule about which solution should be deployed in which order. Conventional wisdom held that a WMS was needed to drive the workflow, that planning had to come before execution. "You can think of planning, execution and reporting as linear, but it's more of a cycle," says Jennifer Lachenman, vice president of product strategy and business alliances for Lucas Systems. "Some customers have chosen to upgrade planning or WMS prior to implementing execution.

With access to both inventory and labor, voice and WCS systems can help redirect resources in real time.

WCS solutions began as middleware between automation and the WMS, but their functionality has expanded much further.
including voice. Some start with execution knowing they will upgrade the planning system later. Some have done both simultaneously.”

As businesses change, Lachenman says a central benefit to voice and WCS is their ability to insulate employees from changes in interface and processes. Even as a legacy WMS is entirely replaced with a new one, the interface on the execution side can remain identical to pickers and operators, reducing the disruptive impact of such a project.

There’s an app for that

A shiny new WMS is likely to be transformative to an operation, but the smallest of software point solutions can be just as impactful.

“Voice and WCS are better than just a Band-Aid for a struggling system,” Sardeson says. “I’m a big fan, and they can be a good investment for an old or new system. I hope the days of ‘screenscrapers’ are over, and in the future we’ll see a more open ability to pass data around to software and hardware.”

The à la carte approach is already gaining steam, with systems offering plug-and-play functionality. Whether it’s one of the many variants of voice and WCS systems or tasks traditionally handled by WMS, Bob Kennedy, vice president at DM Logic, notes a proliferation of targeted, small-scale software solutions. They all reside under the umbrella of “adaptive software,” which he says is analogous to the “app” approach, with an emphasis on ease of deployment, interface and change.

“It’s a radically different paradigm shift in how software is developed and delivered,” Kennedy says. “And it’s not unique to our solutions. The concept is to allow less tech-savvy people to create software so the customer can take control of the direction, evolution and maintenance of their WMS system.”

Kennedy offers the example of a customer who used a lot of seasonal employees. “When they picked using RF, sure enough they made a lot of mistakes,” he recalls. In a matter of hours, the customer built a new message stream for temporary workers with a picture of the target pick and a couple extra scans for verification. Seasoned pickers continued to use the standard message stream. “Over time, they can migrate these workers from the introductory stream to standard, or can build new streams very quickly. To build, test, deploy and confirm that in the past would have taken days and help from the supplier.”

Taking it one step further, Kennedy says if the customer and supplier are building apps they might make them all available to the community on an “app store.” Before creating a new app, the customer could look at the app exchange to see what already exists. “Maybe they pay a fee, maybe they make a couple tweaks, but you’ll develop a community to foster an exchange of best practices,” adds Kennedy.

Companies mentioned in this article

COMMONWEALTH SUPPLY CHAIN ADVISORS, commonwealth-sca.com
DEMATIC, dematic.com
DMLOGIC, dmlcgicllc.com
INTELLIGRATED, intelligrated.com
INVATA INTRALOGISTICS, invata.com
LUCAS SYSTEMS, lucasware.com
OPEN SKY GROUP, openskygroup.com
QC SOFTWARE, qcsoftware.com
With warehousing, distribution and manufacturing professionals focused on doing more with less, speeding up processes and maximizing existing space, overhead handling equipment’s role in the distribution center has become more important than ever. Add automation and other technological innovations to the mix and crane, hoist and overhead handling equipment manufacturers are making sure to keep a watchful eye on worker safety as well ergonomics.

"Overhead handling is a mature market, but we’re always coming up with new innovations and new twists on things,” says Martin Marincic, product manager of cranes for Demag Cranes & Components. “We either look for product improvement or innovative product leaps whenever possible.” That innovation has garnered the attention of major companies like Airbus, which in 2014 ordered 10 Demag process cranes in its new assembly facility in Mobile, Ala. “This project includes several levels of automation and sophistication and also has a lot of safety built into it,” he adds.

The issue of safety has grown in importance for managers looking to put “safety first” within their own corporate cultures. To accommodate this demand, overhead handling equipment manufacturers are emphasizing safety. “Every meeting we have starts off with a safety-related topic,” says Marincic. “We not only make sure that we adhere to all safety standards, but we also offer training at our facilities on how to safely inspect and repair our products.”

Konecranes is also putting a bigger emphasis on safety, according to Chuck Snook, sales manager for Region Americas, WLS. “We’re starting to see a growing shift toward safety as a culture—and basically part of our DNA in the day-to-day manufacturing environment,” says Snook, who sees the push for better productivity and the need for ergonomic products (to alleviate repetitive strain injuries, for example) as the other forces currently driving innovation in the overhead handling sector.

“When we design equipment or add new products to a facility, we’re actually suiting the job to the person as opposed to finding the right person for a
specific role,” says Snook. “Because of this, the equipment we’re making has to cover a very broad spectrum.” That’s where both safety and ergonomics come into play, says Snook, and it’s why both play critical roles in the production, installation and use of overhead handling equipment.

“It’s about being more proactive with materials handling needs and solving problems in advance, as opposed to just reacting to those issues,” Snook adds. For example, he says many companies have policies prohibiting employees from manually lifting anything that weighs more than 30 pounds—despite the fact that many adults can feasibly lift an item of this weight. To satisfy this requirement, overhead handling companies are making workstation cranes like Konecranes’ AirBalancer. This pneumatic powered device aids the operator by allowing him or her to maintain a natural lifting motion. “It almost makes the operator super human,” says Snook, “without slowing him or her down.”

The need for speed
Cleve Pechuekonis, Ingersoll Rand’s global product leader for industrial equipment, says manufacturers have been adding new features and benefits to powered hoist offerings (air and electric hoist) as well as to human-powered manual hoists. Before making those improvements, Pechuekonis says he and his group’s product managers spend a time in the field, working closely with end users. “We’re interested in what they’re doing, what they’re lifting, and what products they’re currently using,” says Pechuekonis. “This helps us identify trends, future applications and unmet needs.”

In the distribution space, specifically, Pechuekonis says his team’s field research has turned up a need to move products as quickly and safely as possible without damage. This, he adds, is how companies become as productive and profitable as possible. To accommodate those needs, Pechuekonis says Ingersoll Rand has developed overhead hoists that are extremely fast and precision-controlled to ensure accuracy and safety. “We currently offer hoists that move product at 110 feet per minute,” Pechuekonis says. “We’re talking about being able to get a product 10 stories high up in the air within 60 seconds, and our customers are still telling us to ‘go faster.’”

Up until now, Pechuekonis says overhead materials handling as a whole...
hasn’t always been as quick to accommodate users’ demands. Because of this, manufacturers are putting more focus on the overhead lifts, the trolley movements, and the actual movement of the equipment on the warehouse’s beams.

With conveyors swiftly transporting items throughout the warehouse, for example, Pechuekonis says the point where the overhead crane or hoist interacts with the pallet (on its way out the door of the warehouse, for example) is a “hot button” area.

“That’s the point where we’ve seen some speed limitations,” says Pechuekonis, who points to pneumatic air hoists as the speediest innovations developed to date. “Electric hoists are still lagging in this area; that’s where we’re seeing some potential opportunities.”

In many cases, the “need for speed” doesn’t come into play until it comes time to actually hoist items up into the air. Only then do companies realize their equipment is ineffective or antiquated. “You don’t think much about the crane until you don’t have access to it, and then you realize just how vital it is,” Marincic says. “This piece of equipment can create a real production bottleneck. To avoid that, managers are looking for reliable, trouble-free cranes that meet their ergonomic applications and safety requirements.”

Preventative maintenance

With more and more attention being paid to analytics and tracking within the warehouse, overhead equipment manufacturers are jumping into the fray and coming up with ways to incorporate such capabilities into their cranes, hoists and workstations. With a continual eye on productivity and safety, for example, Columbus McKinnon is adding more diagnostic capabilities to its products. “We’re trying to provide preventative maintenance data,” says Jeff Armfield, executive director of global product strategy and product development.

When that diagnostic data is easily accessible, machine users can keep better tabs on how their equipment is performing on a day-to-day basis. “Having the data that predicts when a machine needs to be fixed, or when something has to be done, is pretty important,” says Armfield, “so we’re focusing some efforts in that general direction.”

According to Armfield, the focus on providing better diagnostics will help users make more intelligent decisions around equipment usage and maintenance. Through this data and related reports, those users will gain a clear picture of just how their materials handling equipment performs during the course of a day, shift or even a single hour. “It’s all right there in front of them,” says Armfield, “and it gives operators a very clear understanding of how their product is operating.”

For now, Armfield says the larger companies are most interested in
“We currently offer hoists that move product at 110 feet per minute. We’re talking about being able to get a product 10 stories high up in the air within 60 seconds, and our customers are still telling us to ‘go faster.’”

—Cleve Pechuekonis, Ingersoll Rand’s global product leader for industrial equipment

accessing sophisticated data related to their materials handling equipment, although he expects smaller firms to follow suit in the near future. “The big users in our market are definitely doing more of this,” says Armfield, “with the goal of understanding how well their equipment is running and whether or not their investment is providing a payback at the end of the day.”

On the horizon
Over the next one to three years, Pechuekonis expects the time it takes for overhead handling products to travel throughout the warehouse be whittled down even further based on user demand. Concurrently, manufacturers will maintain a focus on safety and on getting products to their destinations in one piece. Looking out even further, Pechuekonis expects more automation to be folded into the overhead handling product offering.

“Users want to be able to hit a button and have a load taken overhead to a loading dock, where it can then be put on a pallet, wrapped and placed onto a truck,” says Pechuekonis. “With one more press of a button, that crane will return to its original location.” And throughout that process, he says companies will be able to track the loads and know exactly where the products are at any given time.

“The technology that will make this scenario a reality is out there,” says Pechuekonis. “It’s just a matter of adopting it at a reasonable cost because some of that capability can be very expensive.”

With wireless technology continuing to infiltrate today’s warehouses, the overhead handling sector will incorporate even more of it over the next few years. “Wireless technology is really taking off right now and we’re having a lot of cool conversations about it,” says Pechuekonis, who has been asked questions like, “Is there an application that I can put on my phone and use to direct an overhead hoist’s activities?” The answer may be “no,” right now, but Pechuekonis expects that to change within the next three to five years.

As the technology that drives overhead handling equipment continues to advance, the key user demands—safety, speed and ergonomics—will likely remain in place. “When we have conversations with plant managers or engineers, the discussion always starts with speed,” says Pechuekonis. “There’s product coming in and product going out, and it has to be moved within the facility as quickly as possible. Plain and simple.”

Companies mentioned in this article
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RAM GUARD™
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Making MES more efficient

Troy Design & Manufacturing pairs real-time RFID tracking with MES, saving time and allowing operators to focus on value-added production activities.

By Roberto Michel, Editor at Large

Not every company with a manufacturing execution system (MES) can cite specifics of how MES has helped them, but that’s not the case at Troy Design & Manufacturing Co. (TDM). The company—whose operations include a facility in Chicago that modifies Ford motor vehicles for police use—counts 7 seconds as the building block for time savings from data capture into its MES solution.

That 7 seconds of savings comes from using radio frequency identification (RFID) technology to track each vehicle as it progresses through the plant, as opposed to hand-scanning bar codes to track work in process. With four production lines and 10 work centers per line outfitted with RFID data capture, that means there are 40 locations in the process where information is automatically gathered without human intervention, says Lee Murray, director of technology for TDM.

By affixing an RFID tag to each vehicle as it enters the facility, the RFID technology acts as a trigger to the MES, telling it which specific vehicle entered a particular work center, and recording exactly when it entered the location. “We wanted to remove as much non-value-added work from our production process as possible, and let’s face it, anytime anyone has to hand scan something, that is not directly contributing positive value to the end product,” says Murray.

MES solutions have been around for decades, spanning functionality such as work-in-progress tracking, electronic work instructions, quality management functions, and production performance metrics. Not all MES solutions are alike, but work-in-progress tracking is considered a core MES function and is an advancement over the days of paper-based methods of shop floor control.

Bar code data collection is commonly used to support MES deployments, but in recent years, some plants have chosen to affix RFID to vehicles, major assemblies or totes to track work in progress in a hands off way. When data captured by RFID is fed into an MES and pushed out to a Web dashboard, the MES deployment takes on an Internet of Things (IoT)-like aspect.
Troy Design & Manufacturing (TDM) uses RFID technology to automatically capture work-in-process data at its Chicago facility. The plant modifies Ford vehicles for police use.
because a near real-time insight into work in progress can be gleaned from a browser. In fact, at TDM, a browser-based dashboard into production status is displayed on several oversized flat screens on the plant floor, and managers also can access it with their devices.

**Hands off data capture**

TDM is a Detroit-based Ford metal stamping subsidiary that had expanded into the vehicle conversion business with its Chicago modification center for police vehicles. Located about a mile from Ford’s Chicago assembly plant, the facility modifies Ford’s Explorer SUV model and Taurus sedans for police use. The center adds options such as ballistic door panels, storage consoles and flashing safety lights to the vehicles.

The center has four production lines with 10 work centers per line, modifying in total about 150 vehicles per day. To support the plant’s production management needs, TDM realized that paper-based methods of work-in-progress tracking and reliance on paper-based work instructions would be too inefficient, so the company deployed a work-in-progress tracking focused MES (Lowry Solutions).

While TDM could have opted to feed the system with data captured from bar code scans, the decision was made to go with RFID because of the way it automatically captures data about when each vehicle enters and exits a workstation. Additionally, says Murray, because the RFID tag holds the unique vehicle identification number (VIN), it also prompts the MES to display what needs to be done with that vehicle at each work center, calling up the appropriate work instructions on a touchscreen computer. With some procedures, the MES prompts the operator to record data using the touchscreen, or to swipe his or her employee badge to the associate who installed a safety critical part.

Most of the RFID readers at the TDM facility are outfitted with four antennae (Motorola Solutions, recently acquired by Zebra Technologies), with one antennae capturing data for one workstation. There are a couple of places where the columns in the building only make it possible for one reader to cover two locations, but for the most part, one reader tracks four locations.

Mark Wheeler, director of industry solutions for North America with Motorola Solutions, says RFID is a good fit with MES because it’s an accurate, efficient way to capture data that is essential to MES’s core tracking function. “With RFID, you have automatic, near real-time visibility into when work or inventory enters and exits a particular location,” says Wheeler.

While some factories in apparel, footwear and vehicle assembly use RFID tags on end products to enable tracking, in many other cases, says Wheeler, it’s a container like a cart, tote or pallet that is tagged, acting as a proxy for whatever materials are being moved on it. “We often see a reusable asset being tagged and tracked passively by the RFID infrastructure,” Wheeler says. “You can tag

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**Acquisitions bring design software and MES closer**

The software that some manufacturers use to simulate and plan the way they are going to make new products, and the software they use to manage manufacturing operations, are drawing closer together. That’s because some suppliers of product lifecycle management (PLM) software used in the design phase are buying up providers of manufacturing execution system (MES) software.

Some of the major PLM vendors offer digital manufacturing software, also known as manufacturing process management solutions, which are used to establish the most efficient processes for making new products. This fall, Siemens PLM, which has a digital manufacturing solution, announced it was acquiring Camstar, an MES vendor. This follows other similar acquisitions, such as the purchase of MES vendor Apriso by PLM supplier Dassault Systèmes in 2013. Dassault also offers digital manufacturing software under its DELMIA brand.

Because of acquisitions such as these, one of the latest MES trends is integration to digital manufacturing. “I do think this coming together of digital manufacturing and MES is important,” says Julie Fraser, an analyst and principal with Iyno Advisors. “Having these solutions as part of the same vendor company should help bring about a closed-loop feedback capability between design and production. But I also think it’s an area that has a long way to go.”

For the joining of the two worlds to really catch on, says Fraser, digital manufacturing needs to break through to a broader market beyond the big automotive and aerospace manufacturers who pioneered its use, and the PLM suppliers who have acquired MES solutions will need to continue to invest in the MES offerings.

Tomasz Pexzek, DELMIA Apriso product manager with Dassault Systèmes, says integration between MES and digital manufacturing has become a standard part of the Apriso product offering with the release of Version 9.7 of the MES, which was announced in November 2014. Under the integration, process engineering details and workflow for a new product can be passed to the MES, and the MES can feed back data on performance once production is underway, such as insights on defective parts.

“By means of this integration, users can design a process, execute a process, and get feedback on how the execution went,” says Pexzek. “Then users can plan improvements and changes, redesign the process to make it better, and execute the improved process.”

Pexzek does not see a major barrier to a closer tie between MES and digital manufacturing, but does believe the companies best positioned to benefit from it are those who have deployed MES enterprise wide, which allows for consistent systems on either half of the closed loop between digital manufacturing and MES.
that asset once and track it for life.”

One benefit of pairing RFID with MES is time savings. TDM calculates that automated work-in-progress time stamping saves 7 seconds per read versus an operator-driven bar code scan. “That might not seem like an enormous amount of time, but when you start adding up the 40 different work centers we have on the production lines, and the quantity of vehicles we are producing, it becomes a significant time savings over the course of a day or a week,” says Murray.

The RFID data capture also means operators don’t have to remember to scan a vehicle as soon as it enters a workstation. Operators still have to interact with the MES and its work instructions, but the data collection related to work-in-progress tracking is taken out of their hands.

“We know that as soon as a vehicle gets moved into a station, the time and date stamp for cycle time is automatically captured,” says Murray. “Overall with this solution, we wanted to make it as easy as possible for operators to focus on adding value to each vehicle. They should be focused on outfitting the vehicle in a high quality manner to the specs that are in the system, rather than performing bar code scans, or digging through pieces of paper,” says Murray.

Process history benefits

Another benefit of detailed data on the manufacturing process is the ability to quickly see what was done to a vehicle, as well as to see where it is located in the process. These benefits stem from both effective data capture and a software system such as MES that can display status and metrics.

At TDM, the work-in-progress tracking function in the plant floor system feeds a Web dashboard application that gives personnel on the plant floor as well as authorized users logging in from a browser a view of the current state of vehicles in process, where they are located, and what’s being done to them. Through the dashboard, everyone can see if the pace of work is on track. The system also links to a Ford database, so TDM is able report vehicle receipt, production progress and shipping updates back to Ford in a timely manner.

According to Murray, the plant floor dashboard isn’t a true real-time system—there is a 15-second lag time between actual RFID time stamps and status update on the Web user interface—but that’s effective enough for work-in-progress tracking.

The combination of the automated RFID reads at each location and further inputs into the MES also create a detailed process history of what was done to each vehicle. There is some semi-automated data collection involved in using the plant floor system, says Murray. For example, serial number information on ballistic door panels is scanned into the system.

Certain pieces of safety equipment that are installed as options call for the operator to perform a badge swipe to record who installed the equipment. Or, an operation may require that some assembly procedures be confirmed, such as torqueing a bolt to a specific setting.

The end result for TDM is an online repository of information on how each vehicle was built. “I can go look up a VIN from the middle of last summer and can quickly tell you when it came in the plant and was commissioned, what line it went down, and what it was outfitted with,” says Murray. “By looking at the system, I can also tell you if it was required for the part, which operator installed an item.”

The combination of RFID and MES results in accurate data for cycle time analysis because there is no human error involved. “It’s not that we don’t trust our operators to carry out data collection steps, but there’s no need to bother them with it when you can automate the time stamping and take out effort and risk in managing throughput,” says Murray.

The system also fits in with TDM’s methods for plant and quality management, which include lean manufacturing and Six Sigma analysis. Specifically, says Murray, using MES and RFID fits in with the lean philosophy of eliminating waste.

“We’re trying to eradicate waste, which can come in the form of operators having to perform excess bar code scans, or the handling of a lot of paper,” says Murray. “I think most plant managers would agree, they want their people turning wrenches or otherwise directly adding value, rather than clicking buttons on a scan device, or shuffling through paper.”

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MODERN MATERIALS HANDLING / DECEMBER 2014 41
Increasingly resilient to global economic moods, 3PL and public refrigerated warehouses persistently achieve modest growth.

By Josh Bond, Associate Editor

Each issue, Modern explores life inside the nation’s warehouses as we cover trends and solutions inside the four walls. To give us some perspective, each year we take a look at the square footage of top third-party logistics (3PL) warehouses and the cubic footage of public refrigerated warehouses.

For this year’s report, we contacted two industry insiders. Dick Armstrong, chair of Armstrong & Associates, weighs in on the 3PL side; and Corey Rosenbusch, president and CEO of both the Global Cold Chain Alliance and partnership association IARW, shares his insight on the public refrigerated warehouse side.

Third-party logistics providers
The biggest global 3PL warehouses have again posted modest growth amid unparalleled pressures to operate more efficiently. These are among the findings of an annual ranking of the Top 20 3PL warehouses supplied to Modern by Armstrong & Associates, a consulting firm specializing in logistics outsourcing. Armstrong forecasts continued modest growth in 2014.

Last year, for the second time in a row, Armstrong predicted global 3PL warehousing gross revenues for 2013 would grow by about 6%, following similar growth in 2012 and stronger growth of 8.2% in 2011. Instead, 2013 actual growth was just 3.2%, a rate expected to hold into 2014.

In the meantime, Armstrong says global trade, not GDP, will tend to inform 3PL revenue growth. His pre-
### Top 20 3PL warehouses, 2014

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Source: Armstrong & Associates

The prediction for 2014 3PL market revenue growth of 3.5% could see the total 3PL market break the $150 billion mark. “If global trade goes up 3%,” he says, “you can expect 3PLs to post two and a half to three times that.”

In terms of overall square footage, a 4.4% increase from $66 million to $591 million square feet is within the margin of error given minor variations in reports submitted by companies from year to year. The total square footage for the Top 10, which again account for 67% of the Top 20’s total with 398 million square feet, is up 4.3% over last year’s figures.

“That growth rate makes sense, since we’re seeing a long-term trend toward larger boxes,” Armstrong says. “So, with the same basic number of facilities, the average will continue to grow.”

Dramatic changes in the number of warehouses are often due to variations in the reports each company submits.
Reports sometimes include forwarding locations, transportation logistics or 20,000-square-foot warehouses. Armstrong says he works to ensure the list focuses specifically on warehousing facilities of 100,000 square feet or more. With that in mind, Armstrong says the number of facilities is essentially unchanged since last year.

The Top 10
Exel retains its place at the top of the list, with three times the square footage of longtime second-place GENCO ATC. GENCO now holds second place with just 1.5 million square feet more than Ryder. After two years in third place, Jacobson was bumped down to No. 5 in 2012 before landing at No. 6 for 2013. They still manage about the same amount of space, as does competitor Ryder, which added just a few million square feet to leapfrog into third place after a stint at No. 7.

Following years of relative stability with regard to the ranking of each Top 10 company, Armstrong says the recent scramble at the top is not surprising given the fact that clients and contracts come and go. That said, averages do not reveal the shifting landscape of facility design. Armstrong notes that alongside the trend toward larger boxes is a proliferation of smaller regional facilities.

Still, more than 75% of 3PL contract warehouse locations are single-
customer, Armstrong says, with the remaining locations averaging 1.7 customers each. Some of the companies on the list have successfully navigated the multi-customer space, he says, noting Kenco (No. 8), Menlo (No. 15) and Saddle Creek (No. 17).

“If it’s the kind of warehousing company that is really a fulfillment center, then obviously it will tend to have multiple clients to smooth things out and better utilize the workforce,” Armstrong says. “But at the other extreme, where you have a warehouse that is actually for manufacturing support, it’s more likely to stay tied to that one client.”

Trends to watch for 2014
“The political climate at home gives you heartburn,” Armstrong asserts. “But the U.S. economy should continue to grow modestly, so on this side of the Atlantic, things are in good shape. The Top 20 will not have much of a problem in North America, but outside of here it’s a mess.”

Italy is in recession, Germany and England are just keeping their heads above water, and Spain has a mess that’s hard to solve, he says. “Of course West Africa is a mess because of Ebola, the East because of periodic disruptions from jihadists, but there is a bright spot in Scandinavia north of the Alps,” he adds.

But Armstrong’s interest is in pending developments in North America between the United States and Canada. At least 15 Mexican trucking companies are now authorized to carry in the United States, including STI, which also operates in Canada. “I find it fascinating, he says. “There will be a big change in the next few years with regard to cross-border traffic and how that happens. And it’s way overdue. The capability is there, and it’s time to let North American trade blend together a little better.”

Armstrong says owner-operators and teamsters have been “fighting like crazy,” but he emphasizes that he’s been watching the quality, safety and general level of Mexican operations for some time. He says,
“most are as good as anything I’ve seen in the United States.”

Whatever the market, Armstrong doubts labor availability in warehousing is a very big issue—unlike the truck driver supply. “It’s at an apex point, and you have a teeter-totter effect,” he says. “The labor supply is level, but it could easily tilt because of a hot economy and a demand for capacity. Any shortage of capacity would happen primarily because of a shortage of truck drivers. The economy is recovering gradually, so right now it’s not a problem. If it hits a real uptick, say economic growth of 7% or 8% in a year, we would be short of truck drivers in a hurry.”

In terms of the wider economy, Armstrong cites a report that suggests new building in prime areas, although it hasn’t taken off yet, will include a slow increase in construction of new boxes. He expects inventories will diminish as evolving supply chains achieve more production using leaner practices.

Changing practices and the ongoing concentration of multichannel warehouses is likely to see 3PLs serving a combination of channels from a single warehouse. “As it gets bigger,” he suggests, “they will probably encompass several kinds of operations within the facility.”

**Public refrigerated warehouses**

This year’s ranking of public refrigerated warehouses (PRW) reflects positive growth, as well as increasing consolidation in the PRW industry. International Association of Refrigerated Warehouses (IARW) has released its annual Global Top 25 list of the PRWs with the greatest warehouse capacity, accompanied by the North American Top 25 List. The Global Top 25 currently operates 3.36 billion cubic feet—a 4% increase from 2013. The Top 25 North American companies now manage 2.7 billion cubic feet, holding level with last year.

Rosenbusch says the growth in space accompanies a shift in capabilities. “I’m almost hesitant to call them refrigerated warehouses, because that suggests these companies only do freeze-
ers and cold storage,” he says. “But they encompass the entire temperature-controlled supply chain.”

Although 70% of the product IARW’s members store is frozen, a shift in consumer preferences toward fresh foods are prompting many to expand their capabilities. “Whereas some traditionally are only invested in assets and offer a service as a third party, a number of companies are getting into the management of customers’ existing facilities,” Rosenbusch says. “The lines are blurring.”

Rosenbusch adds that a number of acquisitions is also changing the landscape of the temperature-controlled warehousing industry.

“The amount of consolidation is some of the highest we’ve ever seen,” Rosenbusch says. “There were some late summer transactions, and the speed of acquisition is not going to slow down any time soon.”

Last year’s transactions include Lineage’s acquisition of Millard, which Rosenbusch says should put the company well north of 600 million cubic feet under management on next year’s list. Lineage also now consists of more than 12 previously independent, family-owned businesses that have come together to be one of largest players in the space.

As the big companies and their facilities get bigger, Rosenbusch suggests it could benefit smaller niche players as well, who will find relatively less competition in that space. Whatever the size, top refrigerated warehouses are handling the ever-increasing complexity of serving clients. Rosenbusch cites a benchmark study conducted across the industry illustrating that, until recently, about 40% of revenue came from value-added services. Now these services account for more than 60% of revenues.

“You always hear about a crunch on human capital and talent development, about the pressure to always do the job cheaper, better and faster in an economy where labor and energy are not getting any cheaper,” Rosenbusch says. “Automation and software are helping, but with the large acquisitions and rapid pace of change, integration is the No. 1 issue I hear from the big firms. One is trying to consolidate between seven and nine warehouse management systems under one umbrella.”

Going forward, Rosenbusch will be paying close attention to regulatory developments relating to the Food Safety Modernization Act (FSMA) and its provisions for food transportation. “It’s fortunate that a lot of the regulations in preliminary processes are things our members have been doing for years,” he says. “But the rules for third-party transportation carriers could become even more onerous.”

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Flow rack system supports range of pallet types and weights

Getrag Ford Transmissions is the world’s largest independent supplier of transmissions and drive systems for passenger cars and light commercial vehicles with around 13,250 employees spread across 24 sites. The company, located in Liverpool, England, sought to centralize storage of incoming palletized parts, but the concept presented a number of challenges with the many variations in pallet construction, size, materials and weights. A new dynamic pallet flow storage system now accommodates a variety of pallet types.

Neil Hodgkinson, contract manufacturing engineer at Getrag, says the project was part of a wider lean logistics project to centralize logistics operations within the plant. “The new pallet flow system has been located closer to our production area and has provided compact, space-saving cubic storage, enabling identical products to be grouped in the same lane and bays,” he says. “This, in turn, simplifies location and order picking of parts to support production of some 1,600 to 2,000 gearboxes daily.”

The new system (Interroll, interroll.com) consists of 228 pallet positions in the rack structure, four pallets deep, three tiers high with 19 lanes. Supporting FIFO (first-in, first-out) storage, the system handles a mix of pallets including Euro pallets (800 mm x 1,200 mm), UK pallets (1,000 mm x 1,200 mm), plastic pallets with bases featuring three runners, and those designed with nine raised plastic feet—all carrying weights from 600 kg to 1,000 kg.

Following extensive testing in the supplier’s facility, each lane was designed with 60-mm diameter rollers at a 78-mm pitch and a safety mechanism to ensure the safety of operators. When an operator removes a pallet from the order picking face, there is a time delay before the device releases the next pallet in line. Speed controllers move pallets at 0.3 meters per second regardless of weight. All of the FIFO lanes were fitted with rollers 1,250 mm wide to future-proof the system in the event 1,200 mm x 1,200 mm wooden pallets are introduced.

Parts now located closer to production lines are picked on first-in, first-out basis.
Darice, a leading distributor of craft supplies, faced the common problem of needing to nearly double the number of SKU pick-faces in its warehouse. Rather than find or build a new warehouse or install a rack-supported pick module, the company used a textile storage system (SpeedCell, speedcell.net) to streamline picking.

Darice was landlocked in Strongsville, Ohio, out of warehouse space and considering a major warehouse redesign. The company installed 88 bays of the new storage system in a 20,000-square-foot area in one of its warehouses. This installation provided almost 12,000 individual SKU locations or “cells,” and houses 50% more SKUs in the same space.

These space utilization improvements continue to pay dividends, according to a manager at Darice, who notes improved overall order picking efficiency of almost 30%. “The increase in pick-face density means pickers don’t have to walk as far to access the same number of SKUs,” he says. “Our pickers simply spend less time walking and more time picking.”

New storage system accommodates 50% more SKUs

Forward pick area uses hanging textile compartments to improve picker efficiency.
SuperValu is the third-largest food retailer in the United States, operating 2,500 stores and serving as primary distributor to a 2,200 more. To separate grocery products from refrigerated and freezer areas, the company installed fully automatic high-speed doors that are approaching their five millionth cycle.

Prior to installing the new door in 2001, the company’s 324,000-square-foot distribution center in Fargo, N.D., had been using flap doors and quick doors with pull ropes to separate the 60,000-square-feet freezer space and 130,000 square feet of coolers containing perishables from the rest of the facility.

“With our old system, we were doing so much maintenance,” says Dwight Heuer, facilities manager. “Now, it’s a lot less hassle and a better seal. The other products would cut down on air flow, but they wouldn’t seal it very well, whereas the new doors can maintain the temperature.”

The new doors (Rite-Hite, ritehite.com) are used to separate groceries from dairy and meat, while a more robustly insulated version enables quick access to the freezer. The doors operate at up to 100 inches per second, contributing to energy savings. Safety features include a soft edge technology, thru-beam photo eyes and motion detection. Since installing the doors, Heuer says maintenance costs and time have been reduced.

“Compared to our previous doors, they run pretty maintenance free,” says Heuer, who adds that personnel keep a close eye on cycle counts and perform the necessary maintenance at regular intervals. “We did some before-and-after testing with an infrared gun. The temperature loss was a lot less with the doors. Our freezer temperature is not only controlled, it also doesn’t have frost problems.”
Universal operates one of the largest cross docks in the United States, supporting leading automotive manufacturers and component suppliers. To coordinate daily visits of more than 800 trailers to 350 doors and 500 trailer parking spaces, the company deployed a yard management system (YMS) combining RFID and GPS technologies. The system’s real-time functionality has significantly improved yard efficiency.

Before the new system, a massive queue of trailers often built up at the facility’s entrance. Once inside, drivers would then have difficulty locating trailers. Daily manual yard checks performed by six yard trucks per shift were a time-consuming and unmonitored activity.

The project (PINC Solutions, pincsolutions.com) included the creation of a facility map and the installation of RFID readers at the gate and on the yard trucks. Rugged touchscreen displays in the yard trucks enable drivers to interact with the YMS. Using RFID and GPS, drivers, managers and yard truck operators now have real-time visibility into the locations of trailers and equipment.

These yard trucks scan temporary RFID tags that are assigned to inbound trailers when they check in and are removed at check out. Guards at the gate can now direct drivers to a drop location or dock door and provide move requests to the yard truck drivers.

“The previous approach limited the volume of trailers we could process,” says Paul Adams, general manager. “We’ve been able to scale to more than 800 trailer visits per day, and reduced the number of yard trucks by one per shift.”

Adams also notes improved service times for Universal’s automotive customers and improved yard safety as a result of tracking the speeds and travel histories of yard trucks.

Real-time view into massive yard boosts efficiency while reducing the number of yard tenders.
Four companies share how they successfully connected the data points to streamline their operations.

By Josh Bond, Associate Editor

As the supply chain targets the efficient movement of both data and materials, myriad solutions must work in concert to capture and collate information at each step. The digital chains of custody are only as strong as their weakest links, which had long undermined operations for these companies.

Here, we take a look inside four facilities: Wesco Aircraft, Slingshot Sports, Allied Glass and Grove Medical. After identifying pain points, each facility strengthened the quality of data transmission while dramatically increasing productivity.
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Inventory management helps manufacturer bring operations stateside

New platform supports rapid growth and scales with expansions.

Slingshot Sports is a Hood River, Ore.-based manufacturer of kiteboards, wakeboards, standup paddleboards and longboard skateboards. The company produces more than 15,000 water boards a year at a plant in North Bonneville, Wash. Using an integrated suite of inventory, manufacturing and customer relationship software, the company was able to bring manufacturing from China to the states, launch a subsidiary and minimize inventory costs.

When it abandoned contract manufacturing overseas, the company also stopped using standard foam cores in favor of locally sourced wood in Washington. Faced with a need to closely tailor inventory to demand, managers sought to coordinate the sourcing of components from 30 suppliers in Asia and Washington state. New work order and assemblies modules enable streamlined production with bills of material, work orders, bin management and other functionality to support lean operations.

The company has more than doubled its revenue since implementing the new cloud-based software (NetSuite, netsuite.com) in 2007, while expanding its network of retail partners in the United States to more than 450. In early 2014, the company enabled online ordering and self-service account management for B2B customers. An alternative to e-mail and phone orders, B2B e-commerce has grown to handle 25% of all orders in just four months, with a 50% to 75% rate expected by 2015.

Slingshot executives say the new integrated platform has given them flexibility and efficiency in managing the supply chain and the business at large. “It gives us one system as a single source of the truth, and it can be easily customized to our needs,” says Greg Kish, Slingshot sales and marketing director. “We have real-time inventory, better reporting, better information on sales orders and shipping, and that’s a huge advantage over competitors that are still using antiquated systems. The biggest benefit is scalability and how we can grow so quickly with it.”

Forklift-mounted printer stands up to strenuous application

More reliable portable printer boosts picker efficiency.

Since its founding in 1953, Wesco Aircraft of Valencia, Calif., has grown into a leading distributor and provider of supply chain management solutions for more than 8,500 businesses in the commercial aerospace, defense aerospace and ground vehicle, industrial, and maintenance, repair and operations (MRO) markets. After mounting rugged portable printers to lift trucks, the company improved picking accuracy, efficiency and reliability.

“The main challenge is finding printers that will take the beating of being on a forklift all day without having to send
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them out for service constantly,” says Sid Schreiber, warehouse operations manager for Wesco Aircraft. “We also have to find a printer that will print labels that meet all of our customers’ requirements. We have had many issues with the printers we have used.”

The company has a global inventory of more than 575,000 stock-keeping units (SKUs) requiring a variety of labels to be printed on-demand. After partnering with an integrator (ADC Technologies, adctech.com), the company selected new printers (Datamax-O’Neil, datamax-oneil.com) that were rugged and compact, taking up less than half the space of a traditional desktop label printer. An anti-vibration quick-lock mounting plate preserves label integrity while printing from a forklift mount.

Schreiber says the printers can be operated with one hand while wearing a leather or latex glove, and because the paper path is accessible through the side of the printer, change outs are quick and easy.

“I have found these printers to be easy to work with,” Schreiber says. “All we’ve heard is good things about the reliability, ease of use and capacity of the labels they feed through it. They have really been successful in a lot of ways.”

On-board terminals ensure swift and accurate data transmission

Manufacturer improves connectivity, lift truck cabin ergonomics and speed with PC-based computers.

Allied Glass, a supplier of luxury glass packaging, stores most of its stock in a warehouse where products are moved by lift truck. After replacing tablet-based terminals with new mounted computers, the company improved efficiency and productivity.

The company’s previous on-board tablet computers had very poor Wi-Fi performance, resulting in frequent network dropouts as the lift trucks moved around the warehouse. This caused delays in goods reaching their intended destination and negatively impacted the site’s productivity.

The new PC-based computers (In-CarPC, in-carpc.co.uk) run an internally developed program that processes the data and transmits it to the company’s back-office servers, in real time, over Wi-Fi. Dual high-gain Wi-Fi antennas mounted on the forklift’s roof ensure a consistent connection. As each product is loaded onto a lift truck, the move is recorded by the driver, who scans the product’s bar code using a wireless bar code scanner connected to a 10.4-inch, touch-sensitive display mounted in the cab.

“We are very pleased with the solution, which has
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significantly improved our Wi-Fi connectivity,” says Russell Bavester, information technologist at Allied Glass. “The computers outperform our previous solution even when the same antennas are used, and our existing barcode scanners work seamlessly.” Bavester says they have also been able to free up a bit of room in the cab, as the previous tablet was very bulky. Further, lead times for new units are a fraction of what they were in the past.

Integrated data capture tools support same-day shipping goals

New hands-free system improves productivity and customer experience.

Founded in 1988, Grove Medical distributes a complete line of medical services, supplies, equipment and technology solutions for nursing homes, home care services, durable medical equipment dealers and other long-term care operators. E-commerce has played a big role in building the company’s B2B business. Recognizing that more than 70% of its orders come in the company’s e-commerce sites, the company deployed new hands-free picking technologies to increase processing speed by 1,200%.

Michael Laico, Grove’s vice president of operations, was charged with implementing a next-generation technology platform. He began with a fully integrated wholesale distribution software solution for distributors (Epicor, epicor.com). His next step was to identify a shipping system that would provide sophisticated freight cost management tools for small parcel and LTL shipments, increase warehouse shipment processing productivity, and directly interface with the new software.

Laico also wanted to accelerate shipment processing by going hands free. His team chose new multi-carrier shipping technology (ADSI adsonline.com), integrated with finger scanners (Motorola Solutions, recently acquired by Zebra Technologies, motorolasolutions.com) and printers (Zebra, zebra.com).

“Our goal was to increase shipment processing speed by a ratio of 10:1 compared to our legacy system,” he says, noting that the company strives to ensure that all orders received by 6 p.m. each day are shipped the same day. They have successfully met that deadline for 320 days.

The new solution exceeded goals by improving processing speed by 12:1 and helped reduce labor by 1.5 full-time employees. For each packed order, the system applies a bar coded license plate with embedded order and shipping data. It then auto-generates invoices, e-mails and reports.

“Our customers absolutely love the customized packing list that we’re able to create for them,” Laico says. “It’s a huge feature in closing new business.” The system also produces customized dock labels, which have further streamlined processing. □
Design wood pallets, unit loads with latest version of software
Version 2.1 of Best Load and Best Pallet software has been enhanced to include a structural analysis procedure for block pallets. Best Pallet software enables the design of almost any wood pallet, and now includes revised stringer pallet input interfaces. Best Load models the mechanical interactions between packaging systems, pallets and storage and handling equipment. By analyzing compression stress distributions imposed on packaging, the software can yield up to 18% cost reductions. User friendly, both software packages may be leased annually, and are ideal for pallet and packaging professionals, buyers and end users. White and Co., 855-552-1158, www.whiteandcompany.net.

Composite pallet meets UL2335 standards for fire retardance
Manufactured from Baydur PUL 2500 two-component polyurethane resin from Bayer MaterialScience, the BLOCKPal composite pallet will not splinter, warp or absorb moisture. It has been tested to meet UL2335 standards for fire retardance. The resin is specially engineered for pultrusion processes, yielding greater shear strength and higher impact resistance that, in testing, make the pallets 20 times more durable than wood pallets. The pallet is offered in custom sizes or in four standard footprints: 1,200 x 1,000 millimeters; 1,200 x 800 millimeters; 1,165 x 1,165 millimeters; and 48 x 40 inches. To support track-and-trace programs, the pallets can be equipped with an RFID tag. RM2 International, 844-779-9858, www.rm2.com.

Transport loads on 48 x 40-inch and 48 x 45-inch light-duty pallets
A line of light-duty pallets is cost-effective and ideal for a variety of shipping applications—from automotive and general manufacturing to food and retail product distribution. Offerings include solid or ventilated deck styles in 48 x 40-inch and 48 x 45-inch footprints. Injection-molded, lightweight and made of 100% recyclable high-density polyethylene (HDPE), the pallets come in a range of options, including nestable versions with nine feet and stackable models with three or five rails. The nine feet and three-rail models support dynamic loads up to 1,200 pounds, while the five-rail model holds dynamic loads up to 2,500 pounds. Because the pallets are reusable, they can transport loads through hundreds of round trips for a lower overall cost per trip. Buckhorn, 800-543-4454, www.buckhorninc.com.

FM-approved pallet made from halogen-free material
More than 18 different pallets are now offered in a new, non-halogenated, fire-retardant plastic material that has been FM approved. Because the material is halogen-free, there are no bromines in it. The material meets environmental, safety and health regulations without compromising pallet performance. Among the pallets offered in the FM-approved material is the 40 x 48-inch HF RackoCell that is edge-rackable up to 2,200 pounds (in the 40-inch direction) in ambient temperatures. ORBIS, 800-890-7292, www.orbiscorporation.com.

Structural foam pallet engineered for enhanced impact resistance
Made of structural foam, the Krypto-Lite (SFK) pallet is engineered to withstand extreme handling conditions through enhanced impact resistance and minimized deck deflection. The pallet’s lightweight structure extends its usable life while reducing cost. Constructed with 100% recycled material, the 48 x 45-inch pallet features four ergonomic hand holds, four-way pallet jack and forklift entry, a smooth deck with four-sided retaining lip and can be equipped with optional seat belts. When empty, the pallets are nestable for efficient storage. Schaefer Systems International, 888-774-8683, www.ssi-schaefer.us.
Nestable pallet can be shipped in quantities of 2,340 per load
With 2,340 nested pallets (78 pallets per stack) filling a 53-foot trailer load, the CPP 100 maximizes shipping capacities. Engineered to be extremely lightweight for use as a one-way export pallet—particularly with air cargo—the maintenance-free unit resists insect, bacterial and fungal infestations. Competitive in price to heat-treated wood, the pallets feature a nine-foot, a 48 x 40 x 5.2-inch dimension with a 0.2-inch safety rim, and are made from recycled material (either ACM or PE). The pallets hold static loads up to 3,500 pounds and dynamic loads to 2,200 pounds.


Easy shipping with eco-friendly, single-use pallets
Offered as economical solution that reduces costs and simplifies shipping, a line of open loop export pallets is constructed from 100% composite recycled plastic. This makes them resistant to insects, bacteria, fungi, acids, fats and solvents. The nestable, one-way pallets minimize load weight while withstanding dynamic capacities from 1,200 to 3,000 pounds. Optional snap on bottom skid runners may be specified for certain models. The pallets are tested in accordance with elements of the ISO 8611 standard and conform to ISPM 15 regulation.


Stackable pallet made of 100% recycled plastic
Newly released, a 45 x 48-inch, cost-effective stackable pallet is made of 100% recycled plastic material. Recyclable itself at the end of its useful life, the pallet is offered as a replacement for wood. The pallet may be specified with or without a lip. It features a static load capacity of 12,000 pounds and dynamic load capacity of 2,700 pounds. For enhanced strength and four-way fork entry, peripheral bottom stringers are incorporated. Lightweight, maintenance-free and sanitary, the pallets will not rot, warp, splinter or harbor infestations. Because they are safe and sterile for cleanroom environments, they can be used in any facility and come in FDA-approved and fire retardant materials. Flexcon Container, 908-871-7000, www.flexcontainer.com.

Association offers two free pallet design software systems
Two free software tools, LoadSync and FastenerSync, enhance collaboration for pallet engineers and pallet users. The programs work with the industry-standard Pallet Design System software package widely used for pallet creation. With LoadSync, users can easily and completely define all pallet and unit load handling requirements, save the requirements to a data file, and e-mail the file to their pallet manufacturer. FastenerSync provides insight into how the fastener influences the strength of a pallet connection. Ideal for use by fastener manufacturers, the software aids in the design of a fastener, then allows its specifications to be saved and sent as a file to the pallet manufacturer.


Protect 48 x 40-inch wood pallet deck boards, stringers with attachment
Engineered to attach to a wooden pallet with three stringers (runners) measuring 1.5 x 3.5 inches and with 0.5- to 0.75-inch thick deckboards, the 39.5-inch wide pointGUARD SP40S pallet protector is offered for use with 48 x 40-inch pallets. Sold as a set of two, the attachments provide protection for the top lead board and the end of the stringers from impact damage by lift trucks or pallet jacks. The units are made of virgin polypropylene plastic and securely attach to the pallet with six 2-inch #8 wood screws. Measuring just 0.25 inches thick and manufactured in orange for high visibility, the units are ideal for pallets used in captive and closed-loop applications, as well as automated and standard warehouses.

Double-leg construction stands up to forklift damage
With 70% of pallet damage occurring in the leg and caused by forklifts, the 40 x 48-inch line of DLR pallets is engineered with patented, double-leg construction. This provides twice the damage protection compared to single-leg pallets, and extends its usable life. The pallet is manufactured from 100% recyclable, FDA-approved materials. Features include a ratchet fastening system (instead of welded or snap construction) and a choice of two easy-to-clean deck designs: open or solid top. Ideal for hygienic applications, the pallet can be used in food, pharmaceutical and retail industries. It may also be specified in fire-retardant, FM-approved plastic materials. Polymer Solutions International, 610-325-7500, www.prostack.com.

Flame-retardant plastic pallets in six different sizes
A full line of JIFRAM recycled plastic pallets is offered in six sizes, ranging from 32 x 36 x 4.5 inches to 48 x 96 x 5 inches. The pallets are ideal for international shipments and feature a slip-resistant surface. Flame-retardant and impervious to bug infestations and extreme climates, the two- and four-way fork entry pallets handle dynamic load capacities from 1,500 to 3,000 pounds. C&H Distributors, 888-316-2223, www.chdist.com.

Rackable GMA pallet offers high strength-to-weight ratio
The new GMA-228 rackable pallet has been re-engineered to achieve lower costs per trip and improve sustainability. Features include a high strength-to-weight ratio for 2,800-pound edge rack capacity (the pallet weighs less than 50 pounds), SnapLock construction minimizes pallet jack damage and allows for easy repairs, a non-cruciform bottom to enhance handling efficiencies and enhanced trailer cubing due to the pallet’s height. In addition to full-color branding options allowing for corporate identification, the pallet also meets current FSMA and e-pedigree traceability standards, providing the ability to track and trace product movement throughout the supply chain using RFID and GPS. Made from high-density polyethylene (HDPE) resin using high-pressure injection molding that prevents moisture and bacteria absorption, the pallet is 100% recyclable. Rehrig Pacific, 800-421-6244, www.rehrigpacific.com.

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**Lightweight distribution pallets reduce transportation, fuel costs**

The Packpal line of lightweight distribution pallets reduces fuel costs in multiple-trip logistics operations. Compatible with both automated and manual materials handling equipment, the series includes eight different models, including nestable versions with nine feet, open- and solid-deck models, recycled materials, three snap-on runners and perimeter runners. The pallets are suitable for freezer applications to –22°F (-30°C) thanks to high-density polyethylene (HDPE) construction. They come in two sizes: 47.2 x 31.5 inches (1,200 x 800 millimeters) and 47.2 x 39.4 inches (1,200 x 1,000 millimeters). Capable of holding static loads up to 3,300 pounds (1,500 kilograms), the pallets transport dynamic loads up to 1,433 pounds (650 kilograms).


**Structural foam pallet features one-piece construction and flow-through deck**

Featuring one-piece construction and made from high-density polyethylene (HDPE) structural foam, the Protech 4048 pallet measures 40 x 48 x 5.12 inches and weighs 42 pounds. It is capable of handling a maximum dynamic load of 4,000 pounds (maximum static load capacity is 30,000 pounds), and can be easily cleaned and sanitized between uses. The pallet’s flow-through deck minimizes trapped water and cross-contamination. For better protection against impacts, the pallet features thick legs and robust ribs. Options include an intermittent perimeter lip, rubber grommets, custom logo molded into or hot-stamped on the side for identification, and a choice of standard colors: blue, black or gray. Pallets made from fire-retardant, decabromide free material (FM approved) may be specified in blue, black, gray, red or green. TMF, 866-713-9446, www.protechpallet.com.

**Specify strength-enhancing features on custom pallets**

A line of custom-engineered pallets, manufactured from recycled plastic, can now be enhanced with a variety of new features. Among them is a heavy-duty, 1-inch non-slip deck board that supports loads weighing more than 1,500 pounds. Sturdy endcaps protect stringers from damage or splitting caused by forklifts. For operations with high levels of humidity or moisture that could cause corrosion, optional stainless steel screws may be specified for use in the pallet’s construction. All pallets are made to order, allowing for unique specification of size, number of stringers, number and thickness of deck boards, static weight capacities, use of casters and other accessories.


**Paired with a lid, pallet system ideal for line-side component deliveries**

Supplied with the ratchet locking enviro-Lid, the enviroPack pallet system for unit load shipments supports lean line-side processes, including just-in-time (JIT) and Kanban. With a footprint measuring 32 x 36 inches, the system reduces inventory and increases plant safety by interfacing with both cart and tug equipment—eliminating forklift use. Lightweight, the pallet is constructed from structural foam and works with most pallet jacks. Multiple top deck options are offered to address specific payload and robotic interface requirements. Engineered for use with totes, trays, bins and sleeves, the system eliminates stretch wrap and banding while improving product retention and load stability. Creative Techniques, 800-473-0284, www.creativetechniques.com.

**Configure steel pallets with removable pins to handle blanks**

A line of steel pin pallets for handling metal blanks eliminates the need for banding, while simultaneously providing a robust frame that increases pallet longevity and product security. The pallets incorporate perforated holes that allow steel pins to drop through. The pins hold blanks in a secure position to reduce transit damage. Custom-engineered to unique specifications, the pallets are returnable, reusable and recyclable. For maximum return shipping density, the steel pins can be removed, allowing the pallets to be stacked for convenient storage and transport. Pins can also be configured to achieve accurate and repeatable blank placement in conventional or robotic destacking applications. Worthington Industries, 614-438-3210, www.worthingtonindustries.com.
**Combination pallet, trays and lid system thermoformed to hold parts securely**

A line of pigeon-hole packs are manufactured of recycled/recyclable high molecular weight high-density polyethylene (HDPE) in a single-sheet and twin-sheet thermoforming process—for tight dimensional specs and intricate detail on the outer part surface. The packs are optimized for weight and structural performance and supplied as a complete system including a pallet, trays and a cover. Features include the ability to load and unload the trays from the sides, as well as hardware to secure each piece together for maximum stability and product protection. Options include custom striping, labels and molded-in lettering. Vinyl curtains can also be applied to the sides of the pack to keep out dirt and debris. Because they are stackable, the packs maximize warehouse space and efficiency while reducing transportation costs. PendaForm, 800-837-2574, www.pendaform.com.

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**Supplement dimensionally inconsistent pallets with aluminum pallet board**

Ideal for use in automated facilities, the ALX SP-95 pallet board supports dimensionally inconsistent (or damaged) wood or plastic pallets, allowing them to be used in automated storage and retrieval systems to eliminate operation interruptions. Constructed from non-toxic, high-performance, thin-walled aluminum extrusions that are robotically welded for high strength, the unit includes ergonomic handhold openings to prevent employee injury. The pallet board resists extreme temperatures, moisture, bacterial growth, corrosion, creep and damage from ultraviolet light exposure. It measures 50 x 42 x 1 inches and weighs 23 pounds. Due to its inherent structural integrity, products can also be loaded directly onto the pallet board. The entire fleet of pallet boards can be tracked and managed with data streaming from bar code, RFID or other tracking technologies sources. ALX Material Handling Solutions, 888-424-4901, www.alxpallet.com.

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**Heavy-duty spill containment decks**

The PIG Poly Deck with pallet jack pockets has been added to the supplier’s line of heavy-duty spill containment decks. Designed for tight areas where lift trucks can’t reach or facilities without powered industrial trucks, the deck’s fork pocket channels are sized and spaced to fit most pallet jacks, allowing decks to be moved quickly and easily with a pallet jack, even when fully loaded. The low-density polyethylene construction resists UV rays, rust, corrosion and most chemicals. A low-profile 6.5-inch design allows for quick access to funnels and makes loading and unloading easy. The 2,000-pound UDL capacity will support two fully loaded steel or poly drums. Textured grating adds traction and lifts out for easy sump access. New Pig, 800-493-4647, www.newpig.com.

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All Litco products are designed to carry your products safely and through the most demanding supply chains.
AGC tows up to 4,000 pounds; carries up to 2,400 pounds
The newest model of the SmartCart automatic guided cart, the 300TT tunnel/tugger is a flexible and affordable way to move products on an assembly line or to transport goods throughout a plant or warehouse. Capable of towing up to 4,000 pounds and carrying up to 2,400 pounds, the vehicle incorporates a 1.25-inch diameter pop-up pin that allows trailers to be towed from underneath, referred to as tunneling. This allows for the automatic coupling and decoupling of trailers, increasing flexibility within an assembly or warehouse operation. Easy to deploy and reconfigure, the vehicles travel along a magnetic path that can be quickly installed, modified or expanded to meet changing production needs. Jervis B. Webb Co., a subsidiary of Daifuku Webb Holding Co., 248-553-1000, www.daifukuwebb.com.

Improved air skid system easier to operate, service
The Airfloat workhorse air skid system has been re-engineered, making it easier to operate and service. The device’s controller can now be carried by the operator during equipment moves or placed on the ground in an upright or horizontal position. The controller has individual flow controls and quick disconnects for each skid, in addition to an air pressure indicator. An optional dead man safety pendant mounts to the controller handle, allowing the operator to energize/de-energize the air skid system with the touch of a button. When the controller is placed on the floor, the safety pendant may be detached, enabling the operator to roam up to 15 feet from the controller while remaining in control of the system. For easier maintenance and inspections, the air skate now incorporates an air inlet block, allowing both the air bearing and bearing tray to be removed in seconds without detaching any external hoses or clamps. The system comes in seven sizes, with air bearing diameters ranging from 12 to 48 inches and individual skid capacities from 3,000 to 52,500 pounds. Align Production Systems, 217-423-6001, www.airfloat.com.

Touchscreen helps operators consistently apply perfect clamp force
Offered as a means to improve load handling and reduce the chance of product damage, the TFC Touch Force Control touchscreen system provides a lift truck driver the ability to consistently apply the perfect clamp force. The customizable pressure control device is ideal for use with the supplier’s line of carton clamps as well as with paper roll clamps and layer pickers. To use the system, the operator visually identifies the load to be handled and selects the load configuration. After just one to three touches, the system automatically selects the proper clamp force for that load, eliminating the need for drivers to consult charts or rely on memory. During the load type and configuration selection process, the system tracks and records the information for later review if needed. Easy to understand, drivers can learn the system’s basics in 10 minutes; training on the entire system takes less than an hour. Cascade, 800-227-2233, www.cascorp.com.

Android-OS touch computer engineered for rugged use
Running the Android KitKat operating system, the Symbol TC70 touch computer combines the ease of a smart phone with the durability, reliability and performance required by manufacturing and distribution operations. The device is supported by more than 50 applications, including price and inventory checks, line busting, assisted selling, workforce and inventory management. Features include a 4.7-inch, high-resolution display that can be used with wet fingers, gloves or a stylus; voice-over-IP-ready configuration; the ability to capture data including 1D and 2D bar codes at extended range, signatures, images, videos and for payment processing; and integrated security to protect business data and network access with URL filters, communication management and sensor lock down. Using Wi-Fi, a push-to-talk feature allows the device to serve as a two-way radio. For durability, the fully submersible computer is IP67 sealed and can withstand high drops to concrete. Motorola Solutions, 847-576-5000, www.motorolasolutions.com.
For classified advertising, or for more information, contact: Jennifer Drevline, 847-223-5225, Ext. 11, jenniferd@caseyreps.com

The Intrepid 48” x 40” specialty bulk box from Buckhorn Inc. was a highlight at this year’s Pack Expo. Intrepid is reusable and is designed for a variety of applications including liquid, powder and food products. It is constructed of FDA approved material, and it offers smooth surfaces for easy cleaning. It handles loads up to 2,500 pounds, and it assembles and collapses in seconds. Up to 240 containers fit in a 53’ trailer.

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Jim Rice

Massachusetts Institute of Technology

**TITLE/COMPANY:** Deputy Director, Center for Transportation and Logistics (CTL), Massachusetts Institute of Technology

**LOCATION:** Cambridge, Mass.

**EXPERIENCE:** More than 30 years working in the supply chain, including 20 years at MIT

**PRIMARY FOCUS:** MIT’s CTL develops supply chain innovation with its business partners and then drives it into practice in the supply chain domain.

Modern: Jim, innovation is in the air. TV commercials tout innovative new products and opinion makers say innovation will lead the economy out of its funk. How did you get interested in researching innovation?

Rice: The thing that motivated me was how frequently I heard people talking about innovation, including our business partners. Most companies wanted to have it, but there wasn’t a clear understanding of what it is they wanted. I wanted to understand what constitutes supply chain innovation, so I talked to a lot of people, read a lot and tried to synthesize it into a simple approach.

Modern: How do you define innovation? What is it?

Rice: Most people think in terms of product innovation, like the iPhone, but the concept can apply to processes as well, such as a supply chain process. Supply chain innovation—very distinct from product innovation—is the combining and application of a mix of inventions, existing processes and technologies in a new way to create improvements in cost, quality, cash and/or service.

Modern: Are there different kinds of supply chain innovation?

Rice: Adapting from Clay Christensen’s work, I say there are two. First, there’s sustaining innovation, or all the things we in the supply chain have been doing for decades. We’ve called it many things, including kaizen and business process re-engineering. These are methods for doing things better, faster, cheaper and at a higher quality. Then, there is disruptive innovation, which significantly changes the economics of a particular process. We say it changes the dominant design, which is a term coined by Jim Utterback at MIT. In the product space, the mobile phone changed the dominant design of the telephone and the DVD challenged the dominant design of recorded media from VHS as standard. In the supply chain, think about computers before Dell. The dominant design was to make a computer to stock that consumers would buy off the shelf. Dell changed the dominant design by making computers to order and selling directly to the consumer. There are other examples, but there aren’t as many examples of disruptive innovation in the supply chain as there are of disruptive product innovations.

Modern: Why is that?

Rice: In the Innovator’s Dilemma, Christensen argues that disruptive innovation doesn’t typically come from the market leaders because they risk alienating existing customers. So if you want to upset the apple cart, you have to be prepared to risk your market position. Plus, it’s not easy to identify a process that is contrary to the dominant design that also is dramatically lower in cost or cycle time. Dominant designs enable various production economies, and so new approaches have to dramatically change the economics of the most economic approach. It’s not easy. Most companies need the continuous improvement from sustaining supply chain innovation, but are unwilling to risk their existing market position to attract to the appeal of a disruptive supply chain innovation.

Modern: Is innovation a necessary ingredient to success, profitability or market leadership?

Rice: I think that companies have to innovate to improve, but not all companies need to pursue disruptive supply chain innovation. In the supply chain, we are slaves to the needs of the go-to-market approach, which means that the supply chain has to serve the business strategy. Supply chain innovation can help serve that need in different ways. If your go-to-market approach is to be responsive, then your supply chain has to be responsive. If you compete on low cost, the supply chain has to figure out a way to be low cost. It’s OK to disrupt the design as long as you can serve that business need.
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