



End-of-Line Automation: This Is Just the Beginning

We live in the golden age of automation. Never has technology – as broad in scope as it is—been so prevalent. From our homes to our cars to our phones to our watches, automation is everywhere.

And more and more, it's in our warehouses and manufacturing facilities. End-of-line automation has redefined packaging efficiency and productivity, all while bringing costs down for operators and manufacturers around the country.

End-of-line (EOL) packaging automation certainly isn't new. In fact, a recent report values the global EOL packaging market at nearly \$4.5 billion, with exceptionally strong growth forecasted through 2027 (Transparency Market Research, 2019). What is new, however, is EOL packaging automation's accessibility. It's never been easier or more affordable to automate your workflows and gain an edge on your competition.

A HELPING HAND

Most people imagine robotic arms when they think of a warehouse or factory automation. These mechanical manipulators have been working alongside humans for well over half a century when the first industrial robotic arm was put into use at a General Motors plant (Moran, 2007).

Today, industrial robotic arms are more capable than ever. Many utilize six axes, giving them a range of motion that can simulate that of a human arm (Crawford, 2017). Many more are 4- or 5-axis arms, such as palletizing robots.

But what's driving warehouse and factory automation today? And more importantly, what's changing the face of EOL packaging?

Automated Guided Vehicles: Driving Automation Forward

Automated Guided Vehicles (AGVs) are the force carrying (and towing) automation forward today.

AGVs alone account for well over half of the global market for EOL packaging automation and their market is expected to expand at a rate more than three times that of the EOL packaging automation market (Grand View Research, 2019).

AGVs are not just for big players in the industry, in fact they are now more accessible to companies of all sizes to increase productivity, efficiency, safety and more, all while reducing costs.

“Even the most expensive AGVs deliver relatively quick ROIs. Five AGVs deployed over three shifts deliver savings of nearly \$1.6 million within five years. Not only that, BUT the ROI can ALSO be realized in just 16 months (Grand View Research, 2019).



Easy to Install at a Minimal Cost

Now, imagine the savings made possible by AGVs that cost half as much or less than those used in Grand View Research's calculations. What AGVs are those? One example is SI Systems own SIMON 2500.

SIMON 2500 is a heavy-duty AGV. Out of the box, it's capable of carrying up to **2,500 pounds** and towing up to **5,000 pounds**. It follows an easy-to-install magnetic tape path, so its route can be laid and even reconfigured in under two hours. What's more, because SIMON 2500 doesn't require a wireless connection, complex programming or even any software, its installation costs are negligible.

So, with the right robot, the ROI is near instant. And the massive savings come even sooner.

Let's briefly examine four popular EOL packaging processes made simpler—and more cost effective by AGV collaboration.



Magnetic tape path

Robotic Palletizers: Thinking Outside the Box

Automatic and robotic palletizers have been around since the 1950s and 80s, respectively. Today, they represent one of the most ubiquitous forms of warehouse and factory automation and for this, we'll cover many of the benefits brought by AGV End-Of-Line collaboration in this section. All benefits, however, apply equally to other EOL applications.

Like all forms of warehouse automation, the market for robotic palletizers is accelerating quickly. Growth of about \$1 billion is expected between 2019 and 2023 (Infinity Research/Technavio, 2019) . You may already have a robotic palletizing system in place. If you do, then you have experience with collaborative robots, or “cobots.”

Cobots work alongside humans, augmenting an established workforce by handling repetitive, predictable and often strenuous tasks. And palletizing, it turns out, is enormously strenuous for humans, causing unusually high stress (Kumar, Mital, Garand, & Persad).



REPETITIVENESS AND PREDICTABILITY – A SAFETY FACTOR

Any warehouse or factory motion that's both repetitive and predictable is made safer and more efficient by automation.

The process of creating neat pallets is repetitive and predictable hence, robotic palletizers, which deliver strong ROIs and deliver exceptional opportunities for automated EOL collaboration.

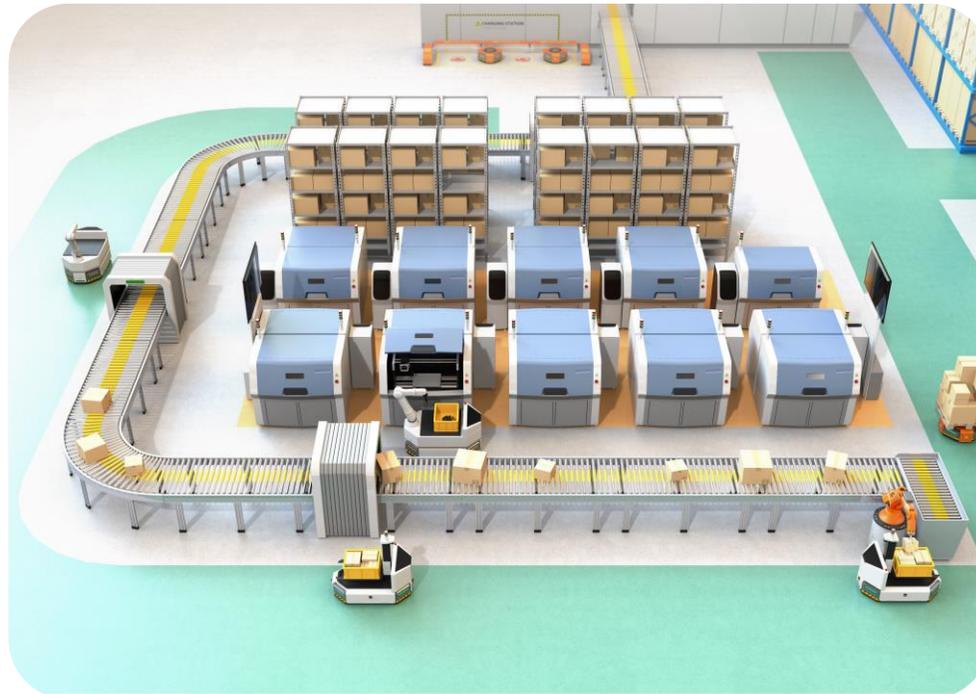
Whichever way a robotic palletizer is fed—conveyor systems are most common—the results will be the same: a tidy pallet, and once a pallet is formed, it needs to be moved. This movement, of course, is both repetitive and predictable and your bottom line is likely to grow⁴ or shrink depending on how you move good.

Save on Floor Space & Labor Cost

A human can use a forklift or pallet jack to move the pallet. But that's costly for many reasons.

For one, it's not an efficient use of labor no matter how tight the labor market.

That human—who has been recruited, hired, onboarded, trained and more—should be deployed where they can be most effective.



A heavy-duty conveyor can move the pallet, but it can be prohibitively expensive to purchase, install, operate and maintain.

Heavy-duty conveyors are also inflexible as reconfiguring its path can cost hundreds to thousands of dollars per square foot in addition to taking up valuable floor space.

A recent survey found the average yearly cost per square foot of warehousing space to be \$6.53 (2017 Warehouse Costs and Pricing Survey).

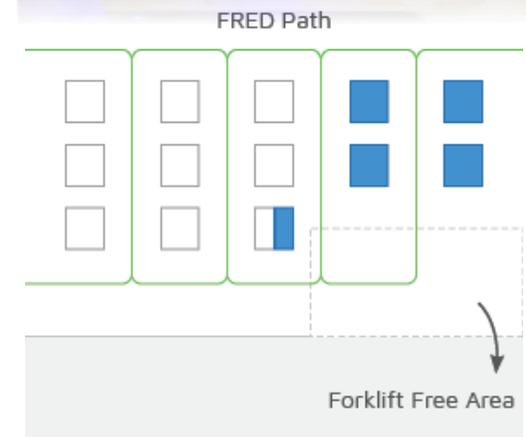
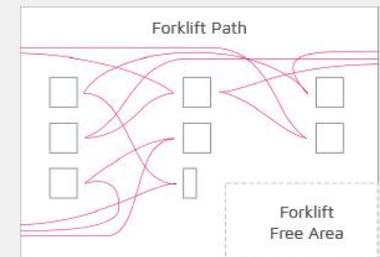
Thankfully, these costly problems have an easy solution. Imagine if, instead of tapping into your valuable workforce or dealing with the challenges of a heavy-duty conveyor, your **SIMON 2500 AGV** could collaborate with your robotic palletizer. What would that look like?

It would look efficient.

LESS ACCIDENTS, DAMAGE LABOR ISSUES = PROFITABILITY

Today's AGVs present opportunities for highly efficient EOL collaboration with robotic palletizers. SIMON 2500, for example:

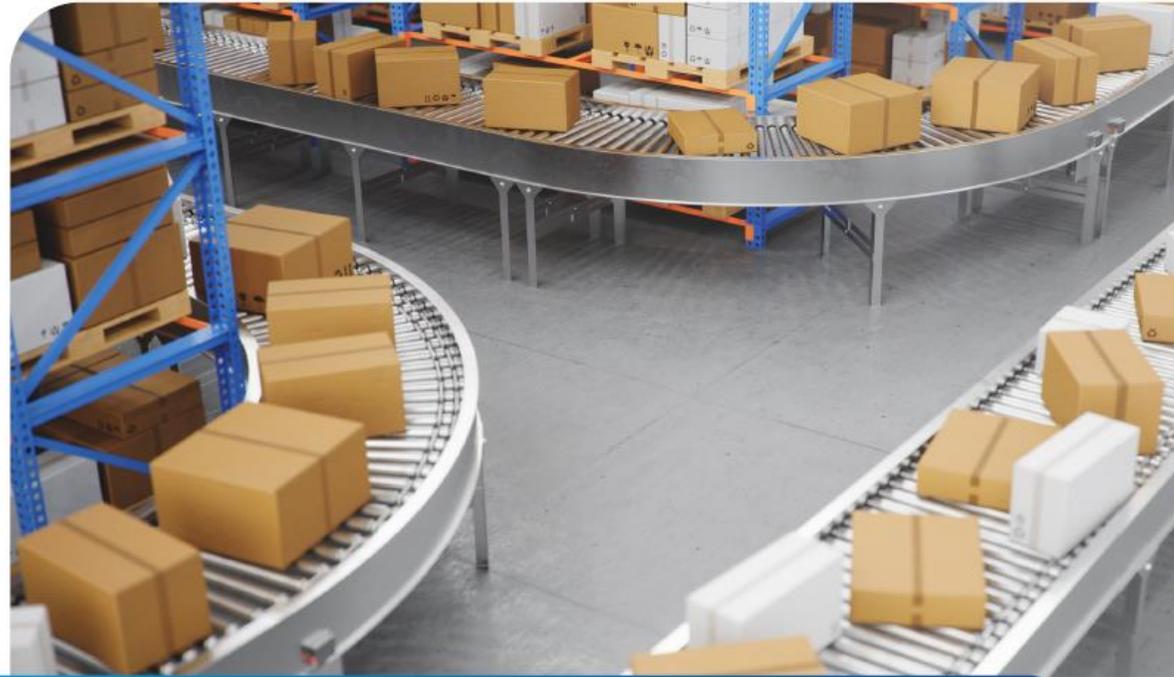
- ✓ Virtually eliminates every hard and soft cost associated with traditional pallet movement.
- ✓ Eliminates labor shortage issues: It doesn't require cost-prohibitive recruitment, hiring, onboarding or training. It can also work 24/7 – no breaks, vacation or overtime.
- ✓ Drastically reduces material damage which costs warehouses and factories billions of dollars annually. SIMON 2500 AGV movements are repetitive and predictable; it follows a predefined path guided by a magnetic tape to your robotic palletizer, wait till a pallet is formed and then be on its way with up to 2500 lbs. of material.
- ✓ With an AGV, you can reduce forklift traffic, or in some cases, eliminate when it collaborates with a robotic palletizers. The U.S. Bureau of Labor Statistics reports that in 2017 alone, forklift accidents resulted in 74 deaths. That same year, they also caused more than 9,000 injuries requiring, on average, 13 days away from work (Occupational Injuries, Illnesses, and Fatalities Involving Forklifts, 2019). These accidents can cost as much as \$138,000 in combined costs. (The Hidden Costs of Forklift Accidents, 2017).
- ✓ Increases safety and reduces error. It will announce its presence with audible beeps and lights, and safety lasers continuously scan for objects and humans in its path. It will come to an immediate halt if it senses imminent danger. Every year, about one in ten fork



Conveyors: Some Still Convey Some Benefits

Heavy-duty pallet-moving conveyors rarely make financial sense in this modern age of EOL automation. Smaller conveyors, on the other hand, still have plenty to offer warehouses and manufacturers. How small? In some cases, small enough to fit on your AGV but let's first look at a slightly larger conveyor system: the Automatic Pallet Feeder.

Pallet Feeders, feed pallets, typically to a short conveyor. The feeders or dispensers themselves often hold between 15 and 20 empty pallets.



Before automated EOL collaboration, the pallets would either be transported to the work area or robotic palletizer by another, larger conveyor system or a forklift (Pallet Dispenser, n.d.).

With an AGV, however, you could cut costs by eliminating conveyors or forklifts while retaining all the utility of your pallet feeder. The feeder simply drops its pallet onto the AGV's top surface before it moves on to the next stage of production.

Another common EOL packaging application is verifying quantity counts by weight. If you manufacture small goods, you're likely familiar with this process. And once again, it's a process that can either tie up your precious human capital or take up floor space with conveyors.

Some AGVs offer an alternative solution, though.

SIMON 2500 for instance, can be configured with a small, powered conveyor mounted on its top surface. In this scenario, once loaded, the AGV will drive from production to the weigh station. There, it can transfer any product to an automatic checkweigher that verifies the product and transfers it back to the AGV, which then drives to warehousing, logistics or the next stop.

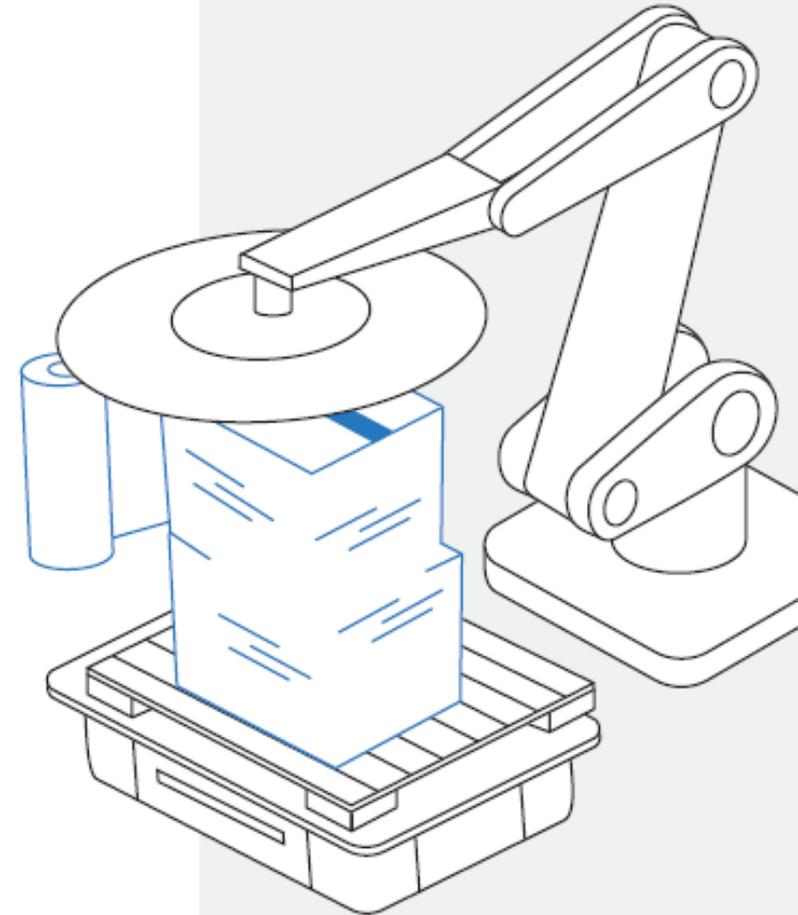
This surface-mounted conveyor option gives you two platforms in one. Or, if you prefer, the most versatile conveyor system available. Transferring product to a scale and back is just one-use case. But you'd now have a mobile conveyor.

Imagine what a mobile conveyor could mean for your application. It has the footprint of a small AGV. It can convey goods nearly anywhere in your facility, with the dual functionality of a conveyor and an AGV. And it could be reconfigured at any time, in little time and inexpensively. The use cases are only limited by your needs and imagination.

Stretch Wrappers: Let's Wrap Things Up

The last of the EOL packaging collaborations we'll examine is between AGVs and semi-automatic and automatic stretch wrappers. After all, that tidy pallet won't stay that way without unitizing.

Like other factory and warehouse automation covered in this paper, the concept behind the stretch wrapper isn't new. In fact, the first stretch wrapper was introduced all the way back in 1973 as a faster and less expensive way to unitize pallet loads (Wathen, 2019). It's safe to say that the idea of using cling film in this way has, well, clung.



SIMON 2500

Warehouse Automation

Today, both semi-automatic and automatic stretch wrappers are available in four primary categories :turntable, orbital, rotary arm and rotary ring. They all serve to support the same result, but get the job done in different ways. How each category of wrappers differs is beyond the scope of this paper. But set up properly, all can collaborate with AGVs to further automate EOL packaging.

It's important to note the slight difference between semi-automatic and automatic wrappers, if only because an AGV can turn your semi-automatic wrapper into an automatic wrapper. Automatic wrappers have some means of feeding full pallets into their wrapping mechanisms, typically by conveyor. Semi-automatic wrappers must be fed manually.

From Semi-automatic to Automatic Wrapper

A properly configured AGV like the **SIMON 2500** will effectively convert any semi-automatic wrapper into an automatic wrapper.

What would AGV collaboration with a stretch wrapper look like? That depends on the type of wrapper. To demonstrate an AGV's out-of-the-box versatility, though, let's focus on semi-automatic turntable and rotary-arm wrappers and let's use **SIMON 2500** as our representative AGV.

SIMON 2500, carrying a loaded pallet, drives onto the rotary platform of a turntable wrapper. The platform spins, unitizing the pallet load. **SIMON 2500** then drives off the platform and to, let's say, your facility's loading dock.

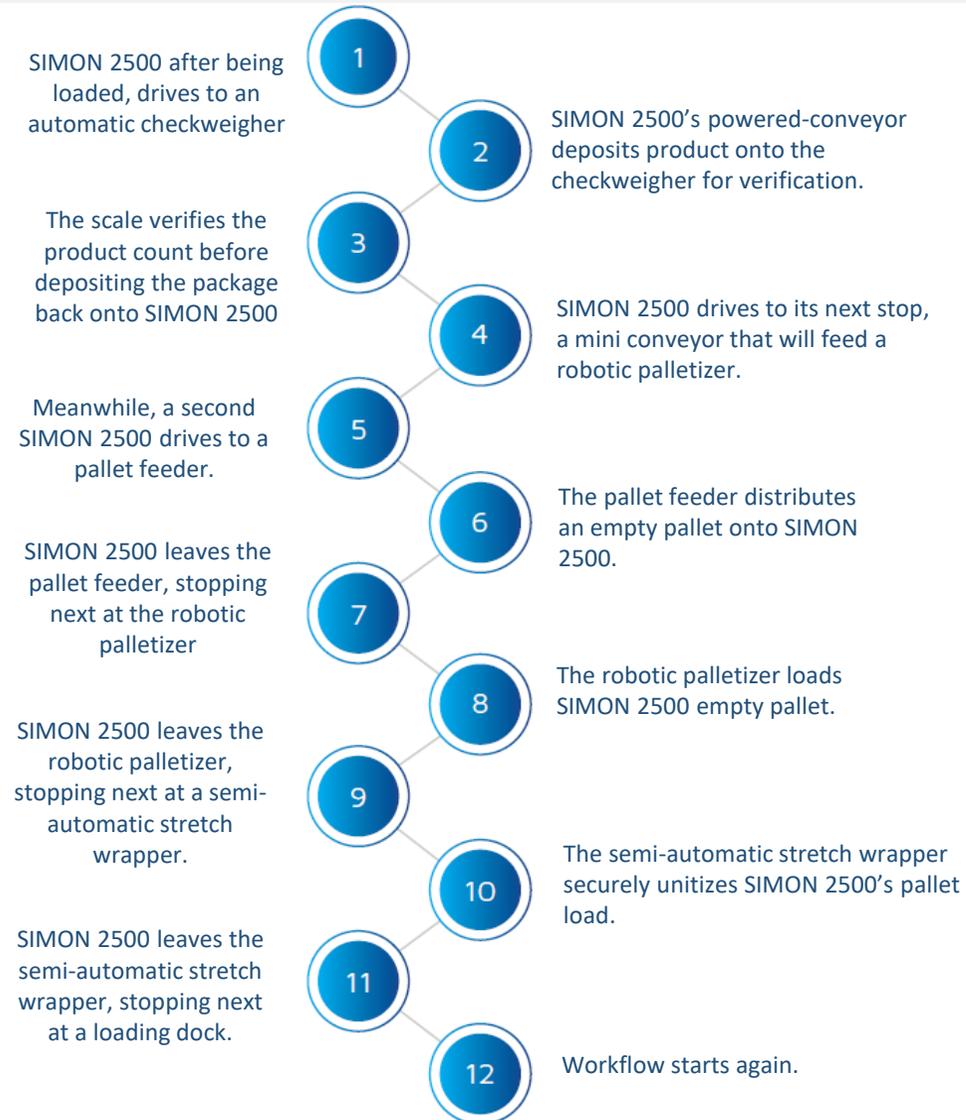
The process with a rotary-arm wrapper looks nearly identical. The only difference is, rather than parking on a spinning platform, SIMON 2500 will park on a stationary platform about which a rotating arm will orbit the loaded pallet to unitize it. Once again, SIMON 2500 drives away.

In each case, what was once a semi-automatic wrapper is now an automatic wrapper—only more capable. It can be fed from any part of your facility on which you've laid a path for SIMON 2500 .



Cobot Collaboration: The Automated EOL Workflow

Now that we've looked at four different collaborations between AGVs and EOL packaging machines, let's take a step back. What does it all look like together? Again, we'll use SIMON 2500 as our example AGV. And we'll bring every EOL packaging process into this workflow.



SIMON 2500

Warehouse Automation

It's unlikely any facility will require every automated step in the above workflow, but it demonstrates the exceptional efficiencies brought forth by automated EOL collaboration. Whatever your EOL packaging challenges, there's a good chance solutions can be found in AGVs.

AGV BENEFITS

- ✓ They will save time, money and space to make your facility and your workforce more productive.
- ✓ They will protect your company from labor shortages.
- ✓ They will increase worker, machine and product safety, and
- ✓ They will allow you to redeploy your skilled workers value-adding activities.

The best part? An AGV like **SIMON 2500** isn't just extremely versatile in its abilities to solve your challenges. It's extremely simple to set up, use and maintain. And its affordability helps you earn a near-instant ROI. If you've been waiting to bring automated EOL packaging processes to your facility, the wait is over. The barrier to entry for automation has been broken.

Ask Us Anything

If you have questions, we have answers. We love discussing automation, and helping our clients solve their challenges in new and unexpected ways.

Please never hesitate to contact an automation specialist at info@sihs.com or 1 (800) 523-9464

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