

Person to Goods (P2G) The rising automation standard in large warehouses









Executive Summary

With order volumes increasing and global labor shortages showing no sign of easing, companies are looking at warehouse automation technology to improve productivity and reduce strenuous and tedious manual work. Of the different warehouse automation solutions available, the use of person-to-goods (P2G) technology in the form of autonomous mobile robots (AMRs) is proving a viable and popular solution for organizations of all sizes for a number of reasons.

- AMRs are **easily deployed** into any existing brownfield warehouse or fully integrated into a new, greenfield site to immediately improve productivity.
- Deploying robotics automation on **mezzanines** is much easier, unlike fixed automation, which uses more space and may also have weight restrictions.
- Integration and deployment can be completed in as little as **four weeks**, without needing to reconfigure workflows or change existing infrastructure.
- AMRs are **safer** than fixed automation solutions and don't have to be fenced off or segregated from human workers.
- Seamlessly **scaling up and down** to meet seasonality, expansion, or growth is almost instantaneous, particularly when used with a robots-as-a-service (RaaS) model.

P2G offers operators greater flexibility, seamless scalability, and proven efficiency that is critical during periods of peak demand, supply chain volatility, and growth, while delivering a much faster and cost-effective ROI.





Introduction

Warehouse automation is not a sector where one size fits all, and the right solutions may vary across different facilities within the same organization. Companies planning to make a significant investment in smart logistics should actively research the options and weigh the pros and cons of each technology for their operation to identify the appropriate choice.

Adoption of the person-to-goods (P2G) robotics automation approach in fulfillment has increased as it is seen to deliver high productivity while also allowing for significant flexibility and scalability to meet the changing needs of today's warehouse and distribution centers. Investing in the right technology is an important business decision for many organizations, especially those with extensive warehousing and fulfillment operations.

Today's P2G solutions aim to dramatically improve productivity and workplace quality, employee satisfaction, and retention rates. They may provide much-needed flexibility to handle seasonal demand or short contracts, while delivering real-time data and analytics insight that further improves efficiencies throughout the fulfillment process.





The differences in warehouse automation solutions

As labor costs continue to rise and shortages affect companies' abilities to meet demand effectively, automation provides a solution. According to the US Bureau of Labor Statistics, the US currently has more than 11 million job openings, with the warehouse and transportation sector struggling to attract skilled workers. However, warehousing technology has leaped forward in recent years and now provides what can sometimes seem a dizzying range of solutions, including robotics. With the rise of e-commerce showing little sign of slowing (with global online sales expected to grow from \$5.7tn in 2022 to \$8.1tn in 2026, according to Statista), robots look set to become an increasingly common sight in warehouses and fulfillment centers around the world.

There are many opportunities for warehouse automation, particularly for a large organization looking to increase productivity across its operations. The latest warehousing technology generally falls into two categories: conventional fixed automation (including goods-to-person or G2P) and person-to-goods (P2G) solutions.

Conventional automation is the catchall phrase for often older, traditional technology such as fixed conveyor belts, automated guided vehicles (AGVs), and automated storage and retrieval systems (ASRS). These systems bring the totes or shelves of products to the person at a fixed location, while P2G typically refers to human workers meeting autonomous mobile robots (AMRs) at shelves for picking or putaway.

Automation solutions like conveyors and ASRS are fixed pieces in the warehouse that can't be moved around as your workflow needs change. ASRS solutions can also take up vertical space in a warehouse, making them less appealing to warehouses with mezzanines for multi-level workflows.

Conventional automation is often seen as the obvious choice because it is what warehouses have done for years or because large-scale smart G2P solutions can be highly customized. However, the implementation process can be long and expensive for any fixed automation solution, and the warehouse is essentially shut down until the solutions are up and running. Additionally, supply chain delays in material availability have extended many installation delivery timeframes.

Many of the problems associated with conventional automation can be resolved through the flexibility and scalability of P2G technology and the synthesis of human and robot productivity that it can deliver.

When the cost versus the amount workers can pick per hour is considered, the P2G solution delivers similar cost savings at scale. It is generally much easier and quicker to implement than fixed station solutions, especially considering the additional installation and associates' training times. P2G delivers far more volume than many large organizations have been led to believe and can also be scaled up quickly by renting additional robots to meet seasonal peaks in demand through a Robots-as-a-Service (RaaS) model.

For companies requiring responsive solutions that are flexible, scalable, and offer multi-item picking, P2G can often deliver what they need at a lower price point and utilize Operational Expenses (OpEx) instead of Capital Expense (CapEx), with systems ready to go live within weeks.



Case Study: Boots

Leading UK pharmacy-led health and beauty supplier Boots has adopted P2G technology to great effect. Having just come out of its busiest-ever Christmas period, the company was operating at off-peak levels before COVID-19 hit. When it saw volumes more than doubling to Black Friday levels of output, Boots chose to use autonomous mobile robots (AMRs) from Locus Robotics to seamlessly and rapidly scale up its operations to manage peak volumes.

This period was also characterized by a sharp decline of in-store sales and a considerable increase in online sales, presenting further challenges. As boots.com Senior Logistics Operations and Commercial Manager Keiron Samways explains: "When the pandemic hit, we saw a massive increase in dot com sales. Without the robots, there's no way we'd have gotten through the volumes."

He notes that the LocusBots could be put into an infrastructure already in place and easily scaled up as needed. In addition, Boots found the P2G automation solution worked exceptionally well with social distancing, unlike traditional manual pick mechanisms where associates work more closely with one another.

Boots has been part of its customers' lives for more than 170 years, but it is now embracing the future and finding that intelligent AMRs create a smoother process, greater productivity, and make work a "bit more exciting and fun for people." As a result of its successful partnership with Locus, boots.com was the 2020 winner of the prestigious Supply Chain Excellence Award for 'Best Use of Robotics'. The company recently hit 200 bots on site, rising from 135 the previous year, with the ability to add more at short notice using Robots-as-a-Service (RaaS) to get greater volumes out when demand peaks.



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- Keiron Samways, Sr. Logistics Operations & Commercial Manager





The benefits of P2G automation

Many large organizations often see unpredictable sharp peaks in demand. They may find conventional fixed automation solutions inflexible, and the technology can be costly and complicated to install. In contrast, P2G automation offers many benefits to customers, large and small: improving warehouse productivity by 2x to 3x or more, delivering a fast ROI, and allowing companies to scale operations up and down quickly to meet demand fluctuations and customer requirements.

Flexibility

As employment, e-commerce, and warehouse sectors change rapidly and may be influenced by factors such as economic downturn, pandemic, energy price inflation, supply chain disruption and conflict, large companies must be agile enough to quickly adapt their operations to meet new challenges and opportunities.

Taking fulfillment to the next level, P2G requires minimal CapEx and fewer changes to existing warehousing than other automation solutions by utilizing existing shelving and warehouse infrastructure, delivering higher productivity within the same footprint.

If space becomes an issue, warehouses can build vertically instead of out by adding mezzanines. Conventional automation systems are often too heavy to use on mezzanines, while P2G solutions are flexible and can quickly and safely work on multiple warehouse levels.

Scalability

The scalability of P2G robotics can be ideal for businesses looking to be responsive to an ever-changing global landscape and meet challenges that arise quickly and effectively.

In the P2G model, AMRs can be added to existing deployments. Using a RaaS model, they can be rented for periods of peak demand or even moved between warehouses to meet demand shifts at different sites. RaaS offers a nominal expense versus a significant long-term CapEx investment, ongoing service, upgrades, and scalable options to address unpredictable volume changes. The inherent scalability is one of the most attractive features of P2G, proving particularly attractive to warehouses that may have brought on solutions they needed for peak season but don't need the rest of the year, preventing expensive solutions from sitting idle.

Faster ROI

For large organizations (both greenfield and brownfield sites), P2G implementations can be easily and quickly accomplished, with many up and running within as little as four weeks while achieving a measurable ROI within just a few months.

With conventional automation, the implementation process includes lengthy design phases, often requires new racks and warehouse infrastructure, and can take anywhere from 12-24 months after the contract is signed.

In contrast, P2G often requires no other hardware and is very user-friendly, making it easy to train workers to use and operate. P2G bots can also use different container types (from existing bins to direct-to-customer packaging) and are compatible with all your existing systems.



For third-party logistics (3PL) providers, the quick ROI and ease of implementation are of particular benefit, as contracts with customers or warehouses may well be changed, and any investments need to generate productivity improvements within the timeframe of an existing contract.

Worker Safety

A P2G solution uses multiple AMRs alongside human workers to maximize productivity. AMRs are safer than fixed automation and reduce the burden on workers by more than half (down from as much as 12 miles a day of walking while pulling or pushing a heavy cart).

The robots take on the travel distance and the carrying of the product, drastically reducing safety incidents common in warehouses, including cart collisions, exhaustion, muscle fatigue and other injuries.

Less walking, more effortless task fulfillment, and a safer environment contribute to a better work environment, leading to more employee satisfaction and higher retention.

Work Density

The system draws on robust, actionable data in real-time about the order pool, associate productivity, and flow management to deliver shorter cycle times and greater productivity. By continually reviewing order pools from the warehouse management system (WMS) using its intelligent clustering algorithm, a P2G system can optimize work density. At the same time, true task interleaving means associates engage with multiple robots to complete more tasks faster, including picking and putaway.





Case Study: DHL

One large company putting P2G solutions to good effect is DHL. The end-to-end global third-party logistics (3PL) provider and its customer, workwear and apparel company Carhartt, worked with Locus Robotics to deliver end-to-end fulfillment across the Carhartt network from its purpose-built facility in Ohio. Focusing on accessories and women's lines, the warehouse operation saw an immediate improvement in productivity and a boost to employee morale from the first day the robots were in place.

Labor retention rates at the site have improved as a direct result of the P2G technology, with the usability of the robots meaning that training associates to use them only takes minutes instead of days. The robots not only do the heavy lifting, but their use means associates do not need to push heavy carts or do lots of unnecessary walking. Associates consider the bots "part of the team," and DHL and Carhartt use them for recruitment by promoting them to potential employees.

The flexibility of the Locus solution appealed to DHL and Carhartt, allowing them to add robots at a couple of weeks' notice to cope with peak levels of demand, leading to a record day of 110,000 units picked. At the Carhartt facility, average units per hour (UPH) picked more than doubled from 60-70 UPH to 180-200 UPH, with correlating reduced cycle times. Dashboard and data mean analysis can take place to ensure products are moved to more efficient locations and the system can grow to scale.

Having had experience with Locus AMRs in its wholesale distribution centers, DHL also found the partnership offered a vast improvement in several areas, including cost model, maintenance, size of robots, and upkeep. By increasing retention rates and reducing cycle time, the smart logistics solution has met and significantly exceeded the customer's SLAs.



The Locus solution is ideal for a flexible environment for operations that go through peak season.

- Reese Clemens, General Manager, DHL Supply Chair





The market for P2G robots: Insight from Interact Analysis

With a strong future growth forecast for the P2G market, the sector's expansion shows no signs of slowing down. According to the latest research from Interact Analysis, there was a delay in the deployment of large-scale fixed automation in 2020 because of plant and warehouse closures resulting from the pandemic. However, the market for mobile automation received a boost because of the reluctance of customers to make significant capital purchases during periods of uncertainty.

There was substantial growth in shipments of P2G robots (more than 125%) in 2020. That growth has continued since, and as of the end of 2022, Interact Analysis estimates more than 16,000 P2G robots have been deployed globally. Most of the growth was concentrated firmly in the year's second half and growth was notably higher for AMRs (which typically require less CapEx, shorter installation times, and offer greater scalability) than for automated guided vehicles (AGVs).

The expectation is that the effect of the pandemic will be net positive in terms of investment in mobile automation. AMRs used to support order fulfillment currently account for only a small proportion of revenues from the mobile robot industry compared with those generated by material transport robots. This indicates the enormous potential for future growth and - despite a fallback in rates from the pandemic peak e-commerce volumes remain well above pre-pandemic levels, continuing to drive growth in smart logistics technologies.

Looking to the future

According to the Interact Analysis study, the scalability, low CapEx requirements, and flexibility offered by Robot-as-a-Service (RaaS) and leasing models have appealed to companies of all sizes. Existing customers are expected to drive much of the market growth between 2020-2023 as they scale up their use and roll out P2G automation across multiple sites. For example, DHL announced in 2021 that it was scaling up its use of LocusBots from 500 to more than 2,000 by the end of 2022.

Projections by Interact Analysis indicate deployments of AMRs are expected to rise from just 29 in 2018 to over 5,000 by 2027. Similarly, the installed base of the bots is estimated to have increased from just 1,284, growing sharply to 16,000 in 2022



and is forecast to soar to nearly 400,000 at the end of 2027. Growth is expected to be exponential rather than linear until 2027, with P2G projects costing an average of \$1m per site, considerably lower than fixed automation. RaaS solutions can push the initial outlay down as low as \$100k.

As the global rollout of mobile P2G robots continues, 3PLs are forecast to form the largest customer base for the technology, attracted by low CapEx, scalability, and flexibility. By targeting retailers and 3PLs, including those operating globally and across multiple sites, P2G vendors are pursuing a 'land & expand' strategy that is expected to drive huge volumes in the future. At the same time, the US is anticipated to drive demand over the coming years, with faster growth witnessed within Europe/APAC.



P2G is ideally suited to brownfield and greenfield warehouses and offers ease of deployment without requiring businesses to put their operations on hold.

Ask Ash...

A chat with Ash Sharma, Managing Director of Interact Analysis and lead for the company's Robotics and Warehouse Automation group

Why might large customers shy away from P2G?

Ash Sharma: "In some cases large companies may want to build a fully automated warehouse or solution if they can accept not achieving an ROI so quickly. They might be aiming for a higher throughput and a higher reduction in labor or have relatively stable levels of demand, without massive seasonal peaks."

Why are large customers considering P2G as an option?

Ash Sharma: "It's all about scalability and ease of deployment. P2G is uniquely capable of addressing brownfield warehouses and offers ease of deployment without requiring businesses to put their operations on hold for long periods or modify warehouses. But it is equally suited to greenfield deployments."

And, finally, what do you think the future holds for P2G?

Ash Sharma: "P2G automation is rapidly being adopted by customers, particularly major 3PLs that value scalability, fast ROI, and the ease of deployment. No one solution will ever be right for everyone – there will always be space for fixed automation and P2G – but P2G is growing fast."





Is P2G the solution for you?

Following the COVID-19 pandemic, global supply chain shortages, and political unrest, it is increasingly important to many companies, particularly large enterprises, to have the ability to adapt to any challenges and opportunities that can arise. This means that flexibility and scalability within the system are vital.

Flexibility is one of the strongest features of a P2G solution, particularly given recent volatility and the need to scale up and down as required. P2G solutions are responsive and allow for rapid changes in supply chains to be absorbed by the business while continuing to meet customer needs.

As today's leading national, multinational organizations turn to AMRs, the P2G solution can have almost unlimited flexibility and extensibility. You won't have to choose between building to normal demand and being unable to handle peak demand or be concerned about overpaying for automation that goes unused for large portions of time if building for peak capacity.

You need to consider a range of additional questions when deciding on the best possible solution for your supply chain operation:

- Do you have the luxury to have unused space and resources (and potentially your whole warehouse) in downtime?
- Can you scale up and down quickly in response to changing demand?
- What is the most important factor when investing in warehouse automation?
- Meeting peak demand?
- Flexibility?

- Scalability?
- Improving productivity?
- Use of capital?

P2G offers benefits in all these areas and can also provide you with the opportunity to attract and retain employees. We have seen how it has been credited with improving the well-being and engagement of associates, reducing the need to fill open positions and more than doubling and tripling productivity rates.

Before opting for a P2G or traditional automation solution, businesses of all sizes should consider their unique requirements, research, and select the right option to suit their needs.





Case Study: GEODIS

Another global 3PL company using P2G robots to great effect is GEODIS, which has reported more than doubling its productivity levels (from 50 units per hour (UPH) picked to over 100 at some of its sites).

GEODIS's Director of Innovation, Andy Johnston, outlined the positive impact LocusBots have had on its operations across many fulfillment centers, including enhanced safety, better employee engagement, and improved productivity.

As labor shortages continue to affect companies around the world, Johnston praised the capability offered by P2G solutions to supply teammates with technology that makes their job easier and more enjoyable. The Locus robots significantly reduce the amount of unnecessary travel and the need for workers to push carts around the warehouse while also cutting training times by around half, with associates able to use the technology by the end of their first day. This makes it much easier to hire seasonal staff for peak fulfillment periods. Employees do not have to use taxing RFID screens and scanners or worry about batteries dying, instead using the user-friendly interface on the robots. Interactions have become "almost conversational" in the form of commands from associates and requests from the bots themselves.

One of the major benefits of the technology that GEODIS had been surprised by is the visibility offered by the P2G solution in the form of dashboards and analytics. Managers can see work on the board, UPH, daily volumes picked, and other real-time metrics in an easy-to-read and understandable format, making data more actionable.

GEODIS is now exploring ways of combining pick and putaway to reduce unnecessary travel further and is considering the potential of expanding its use of P2G automation to replenishment and problem-solving, as well as across more sites. Commenting on the Locus P2G solution, Johnston said, "At GEODIS, we know that we have to continue to evolve," adding, "we believe in the technology" and "I think the possibilities are endless out there."



Locus allowed us to service peak levels like we've never seen before

Daniel Ferguson, Director of Continuous Improvement GEODIS





Conclusion

One thing is certain: mobile automation is here to stay, and the market is evolving rapidly as solutions become increasingly sophisticated. There are pros and cons to all kinds of automation regarding smart logistics solutions, with P2G technology, offering many benefits to organizations, depending on their needs.

P2G is being chosen over conventional automation for the agility, flexibility, and scalability that companies, large and small, demand in an ever-changing global marketplace. For 3PLs, this is particularly important, as is the potential to spread costs rather than invest in a large initial CapEx. The RaaS model lowers customer barriers, while associates discover the many ergonomic and workplace quality benefits of working alongside robots on their team.

Many large businesses are now investing in various technologies, adapting their choices to suit each particular site and the demands of individual contracts. A bright outlook is forecast for the P2G sector, with growth currently driven by customers who have found that AMRs provide them with the ideal synthesis of human and machine capabilities to meet the challenges and opportunities of the future and are eager to invest further.







About Locus Robotics:

Locus Robotics is the world leader in revolutionary, enterprise-level, warehouse automation solutions, incorporating powerful and intelligent autonomous mobile robots (AMRs) that operate collaboratively with human workers to dramatically improve product movement and productivity 2–3x. Named to the Inc. 500 two years in a row, and winning over 17 industry and technology awards, the Locus solution dramatically increases order fulfillment productivity, lowers operational costs, and improves workplace quality, safety, and ergonomics for workers.

With more than 100 of the world's top brands and deployed at 250+ sites around the globe, Locus Robotics enables retailers, 3PLs and specialty warehouses to efficiently meet and exceed the increasingly complex and demanding requirements of today's fulfillment environments. Locus is headquartered in Wilmington, MA (USA) and Amsterdam, The Netherlands. Locus Robotics is a member of the Inc. 500.

For more information, visit www.locusrobotics.com.

About Interact Analysis:

With over 200 years of combined experience, Interact Analysis is the market intelligence authority for global supply chain automation. Our research covers the entire automation value chain – from the technology used to automate factory production, through inventory storage and distribution channels, to the transportation of the finished goods. The world's leading companies trust us to surface robust insights and opportunities for technology-driven growth.

To learn more, visit www.InteractAnalysis.com





Watch the on-demand P2G webinar to learn more.

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