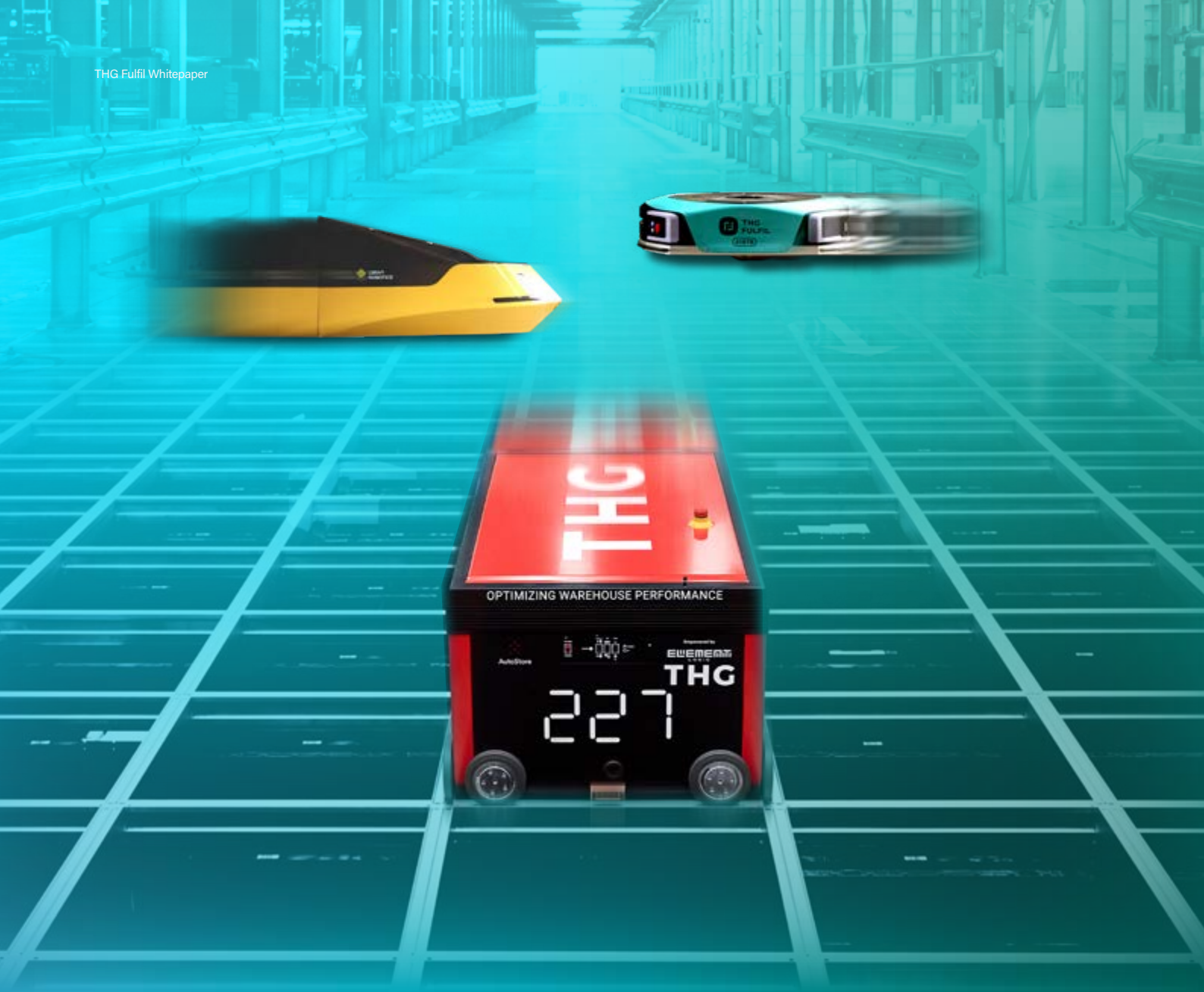


A Complete Guide to Warehouse Automation.

THG Fulfil's Journey from Manual to 200% Productivity Gains.

Sponsored by

THG FULFIL

www.ingenuity.com/fulfilment

Libiao ROBOTICS

John Gallemore

President of THG Ingenuity

John is the President of THG Ingenuity and formerly served as Chief Operating Officer of THG PLC. Over the past 20 years, he has overseen the transformation of the business from a small, paper-based 3PL shipping just 10 orders a day into a global network of automated fulfillment centers.

Today, the operation ships over 35 million orders annually to 19 million customers across 191 countries. This growth has been powered by proprietary software and cutting-edge fulfillment robotics, integrated with a sophisticated global courier management and delivery network.

The result: world-class customer satisfaction and retention, alongside consistent year-on-year reductions in distribution costs even during periods of high inflation.

Contents

In an era where speed, accuracy, operating efficiency and scalability define market success.

THG Fulfil has transformed from traditional warehouse operations to becoming a globally recognized leader in automated fulfillment solutions for third-party brands and retailers. Our authority as market leading in terms of UK service levels is most easily defined through two keys service stats:

1am

Cut off for Next Day Delivery orders.

1.5 days

The average transit time across all orders, standard and expedited from point of order on the website to delivery at the doorstep.

This whitepaper chronicles our comprehensive automation journey, from the initial challenges that sparked our transformation to the measurable business impact that positions us at the forefront of the industry as an operational solutions provider.

Our results speak for themselves:

Through strategic implementation of cutting-edge technologies including AutoStore cube storage systems, Geek+ autonomous mobile robots (AMRs), and Libiao's AMR based sortation solution we've:

Reduced fulfillment errors by **70%**

And established **99.8%** system uptime across our operations

Achieved productivity improvements of up to **200%**

More importantly, we've created a blueprint for cost effective and sustainable growth that enables us to deliver for our clients, the increasingly service led demands of today's commerce landscape.

This document details not just what we accomplished and the resulting benefits for our clients, but why and how we did it providing insights into our decision-making process, implementation strategy, and most importantly the continual optimisation of cost and service that deliver ongoing results for our clients. For any business considering their own automation journey, we offer practical guidance learned from real-world deployment across global facilities and client operations.

01.

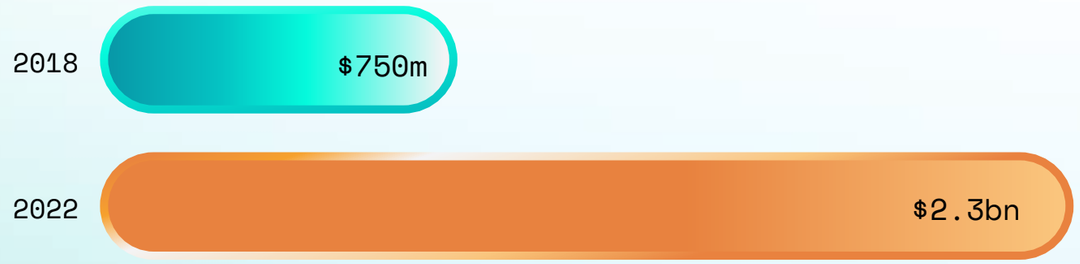
The Starting Point: Life Before Automation

01.

Operational Necessity: Unprecedented Demand Explosion During Covid Lockdown.

Before embarking on our automation journey, THG Fulfil operated like most traditional fulfillment centers relying heavily on manual processes that, while functional, were increasingly inadequate for modern commerce demands.

These typical issues were exacerbated by the demand explosion that typified the covid lockdown period. In a two-year period from 2019 to 2021, turnover at THG doubled, increasing from $1.1bn to in excess of $2.2bn. Whilst over the four-year period 2018-2022, turnover increased $750m to $2.3bn



Labor-Intensive Picking Operations:

Pre-automation pick rates averaged 60-80 items per hour per associate, with significant variation based on order complexity and picker experience. During peak seasons, we struggled to scale our workforce quickly enough to meet demand surges, leading to overtime costs, service level compromises and huge diseconomies of scale due to inferior performance metrics from less experienced colleagues. In short, the more volume we introduced, the less efficient we became.

Pick rate per hour
60-80

Error rates
1-2%

Accuracy Concerns:

Manual picking processes resulted in error rates of approximately 1-2%, which translated to costly returns, customer service escalations, and brand reputation risks for our clients. Each error required investigation, reprocessing, and often expedited replacement shipments.

> **In short, it became very evident that in 2019 we had run out of space, and labor inefficiency was crippling our operating cost base. We simply had to invest in capacity, and quickly, if we were to maintain our growth trajectory. Despite its materiality, at this point operating cost was a much lesser consideration. We could fix that with time, but we simply could not turn away new business due to a lack of capacity.**

Less than
25%↓

Space Utilization Challenges:

Our traditional shelving systems were consuming valuable warehousing space inefficiently. Increasingly lengthy pick paths and dead overhead space delivered very poor space utilization metrics at less than 25% of available cube.

These challenges created a compelling case for transformation but also highlighted the complexity of changing established processes whilemaintaining service commitments.

01. 02.

Why We Chose to Automate and Selection Criteria for Type of Automation

During the demand explosion of 2019, it was clear that space was our primary concern and at that time we commissioned the build of a new 550k sq. ft. facility in Manchester, England.

The project plan assumed that we would have access to the new building in the May of 2021. That gave us 5 months to complete a Cat B fit out, install, test and commission some form of automation whilst integrating into our existing software systems. Failure to meet that deadline would render our peak trading period of November and December as a disaster.

Our selection criteria were simplified because of the time pressure. We needed to maximize space utilization whilst minimizing commissioning risk. We never considered any ROI or payback models. It was a case of survival. There were no committees.

550 sq. ft.

Technology Architecture Decisions

AutoStore as the Foundation

AutoStore's cube storage system became our primary technology choice due to its proven track record as the world's fastest goods-to-person solution while being incredibly space efficient. The system's modular design also would enable gradual scaling while maintaining operational continuity, so future proofing that investment and site.

Key advantages that influenced our selection:

- **Space efficiency:**
  Ultra-dense storage increases capacity up to 4x compared to manual warehouses.
- **Reliability:**
  Global uptime of 99.7% and mean time between failures (MTBF) of over 3,000 hours.
- **Flexibility:**
  Adaptable to existing facility constraints without major construction.
- **Integration readiness:**
  Robust API connectivity with warehouse management systems and a very simple drop into existing software frameworks massively reducing any configuration complexity, a simple one-point connection between 2 pieces of software.

Technology Architecture Decisions

Geek+ AMR Fleet Integration as the initial supporting cast

Having commissioned AutoStore in a new greenfield site, it left our original site in need of redesign. It was largely based on traditional mezzanine infrastructure with rows and rows of shelving and manual pick paths.

These areas had been cleared of inventory as we commissioned the AutoStore and a more appropriate type of automation was necessary to fit that infrastructure, but also to complement the capabilities of the AutoStore, by allowing us to automate the storage and retrieval of less standard-sized items.

Note: The annual spikes in the cost graph below reflect the November cost line during which we switch to batch picking, which introduces a new process, largely delivered by temporary, and consequently less efficient labor.

To complement AutoStore's cube storage efficiency, we integrated Geek+ autonomous mobile robots to optimize the storage efficiency across our mezzanine structure. This multi-technology approach also addressed different operational requirements, typically around size of SKU. We also relished the opportunity to undertake a full side by side appraisal of the two different types of technology with respect to key operational aspects such as commissioning ease and cost, inbound/outbound metrics, uptime and ultimately pay back on investment. This would allow access to largely externally unavailable data points that would drive our future investment strategy or payback models. It was a case of survival. There were no committees.

Technology Architecture Decisions

Libiao ROBOTICS T Sorter Integration as the Accelerant

The AutoStore system has a theoretical capacity which will be a function of grid size, number and type of robots and number of pick ports. It will manifest in a theoretical capacity number of bin presentations for a period of time.

This capacity can be significantly impacted by picking regime, more specifically whether batch picking or picking to order are deployed. Each will have its own theoretical capacity. Additionally, the AutoStore distribution method depends upon approved distributors whose own objectives will not necessarily be aligned with those of the client/user.

The typical response to capacity issues will be to attempt to sell more of the same, be that a grid extension, more robots or more pick ports. The marginal cost will be excessive relative to additional return. Alternative solutions will not be presented if the distributor is limited in its product set.

The Libiao T Sorter is an AMR based sortation solution designed to be modular and flexible, the initial focus of deployment is to work alongside the AutoStore, to turbo charge its output by specifically facilitating larger batch sizing with the single objective of increasing the number of items that can be picked from each bin presentation. The simple arithmetic is that if say a system delivering two items per bin presentation can be increased to four items through larger more efficient batching, then the systems outbound capacity can be doubled. Achieving a greater hit rate yields dividends in system performance also by decreasing the total number of presentations required overall reducing our longer-term robot needs as we continue to grow our fulfillment offering.

Adopting a multi-technology approach in this format compares very favorably to the costs of extending our existing AutoStore grid.

The Automation Revolution: How Intelligent Robotics Are Transforming Logistics

Why Automation? The Pain Points

Traditional logistics struggles with inefficiency: labor shortages, human errors, and rigid systems. Manual sorting leads to delays, while even conveyor-based automation creates bottlenecks with fixed paths. Meanwhile, workers waste hours walking aisles to pick orders costing speed and accuracy.

Game-Changing Solutions

01

Robotic Sorting: Precision Without Constraints

Direct-to-destination sorting eliminates conveyor loops, achieving:

99.9%
Accuarcy

70%
Lower labour cost

3X

Efficiency gains vs. manual processes.

Industries transformed: E-commerce (5,000+ items/hour), pharmaceuticals (35,000+ units/day), and cold chain (closed-loop safety).

Game-Changing Solutions

02

AirRob: Bin-to-Person Storage Revolution

Robots bring bins to workers, slashing picking time by 60% and boosting storage density by 3x. It is perfect for High-SKU warehouses, cold storage, and rapid order fulfillment.

The Broader Impact: Advancing Warehouse Efficiency and Sustainability

LIBIAO's automation solutions combining intelligent robotic sorting with AirRob's bin-to-person retrieval, deliver comprehensive operational enhancements. This end-to-end approach optimizes workflow efficiency while significantly reducing energy consumption by up to 50% compared to conventional systems.

Additionally, the system's space-efficient design minimizes warehouse footprints, and its automated processes enhance workplace safety by reducing manual handling.

The Bottom Line

The future belongs to warehouses powered by adaptive robotics. LIBIAO's solutions intelligent sorting + bin-to-person automation, deliver unmatched speed, accuracy, and ROI. The question isn't if to automate, but how far ahead you'll be by starting now.

John Gallemore
President of THG Ingenuity

"Partnering with Libiao represents a strategic step forward in expanding our automation portfolio. Their T-Sort technology complements our existing systems by unlocking greater efficiency in sortation, batch picking, and multi-channel fulfillment. What stood out to us is the modular, flexible design seamlessly integrating with other automation to double outbound capacity while reducing long-term infrastructure costs. This collaboration allows us to address complex operational requirements today, while positioning THG Fulfil to adopt emerging technologies like AI, computer vision, and IoT tomorrow. Ultimately, Libiao strengthens our ability to deliver faster, smarter, and more scalable fulfillment solutions for our clients."

03.

Integration Process & Execution

We will consider each type of automation against a standard set of criteria.

Speed of commissioning

AutoStore

The physical and systematic build of this system, which was one of the largest constructed globally at that time, was just three months from access to the building to the commencement of ingestion of inventory. The lack of complexity in both physical construction and software configuration are equally in play to achieve this. It took a further 2 months to ingest 10m units of inventory, while existing business continued without interruption, and the first order was shipped after 5 months. The physical build can be simplified by describing it as a large Meccano set. The systematic build required one simple connection between the robotics control system and the client's warehouse management system.

Geek+

Fairly low physical complexity levels. The physical build comprised caging the appropriate area, carrying out minimal floor repairs to remove any outside of tolerance joints, marking the floor, and building the shelving and workstations. Our build was in phases, so we were able to start shipping orders before final build was complete. A simple systematic connection to our WMS following a blueprinting exercise to determine the operational requirements.

Libiao Robotics

This one is very straightforward. Two weeks of work to ready the AutoStore by creating/amending the associated ports and 40 days of T Sort build. The T-sort system itself consists largely of modular constructed elements and can be configured to fit individual needs. The software configuration is equally simplified but will involve connections with both WMS and WCS depending on the application.

Reliability and Uptime through early stage of commissioning.

AutoStore

Very high reliability from day one of commission reflecting the fact that it's a closed box. Initial complexity arose from interaction of batching strategy in WMS on the third party robotics control system and process on the exterior of the system to deal with picking strategies, namely batch picking or picking to order at system port.

Geek+

The system suffered from common issues specifically around light barrier breaks from nuisance tripping at inbound and outbound ports. Additionally, if loaded incorrectly, the racking can be unstable, or items can fall from the shelving while in transit. This will cause the system to stop until said item is retrieved. These issues are more a consequence of the broad range of non-standard sized products within the system than any design issue and are all solvable. We operated at c.60% uptime for the four months following commission. Fixes that we identified were at times slow to deploy. That said, we have operated consistently in the high 90%'s post those fixes.

Libiao ROBOTICS

With the build due to launch in September 2025, it is too early to state at the time of writing.

04.

Optimization & Diagnostics

Post-Implementation Performance Analysis

Baseline vs. Automation Metrics

Our measurement framework tracked performance across multiple dimensions to quantify automation impact

Labour Rates: AutoStore

We deployed the system in mid-October 2021, right ahead of peak Cyber trading time. The first month was run picking and packing to order at port as we learned the system. We then switched to a batch picking system for Singles Day and Black Friday. This created new processes and additional complexity.

These strategies also exposed limitations in the control system. During this two month period operating costs rose by 30% on the baseline. Once the peak trading period was concluded, work began on optimisation and the results were amazing:

01.

In year one, operating costs fell by 33% on the base line.

33%↓

02.

Year 2 delivered a further 21%

21%↓

03.

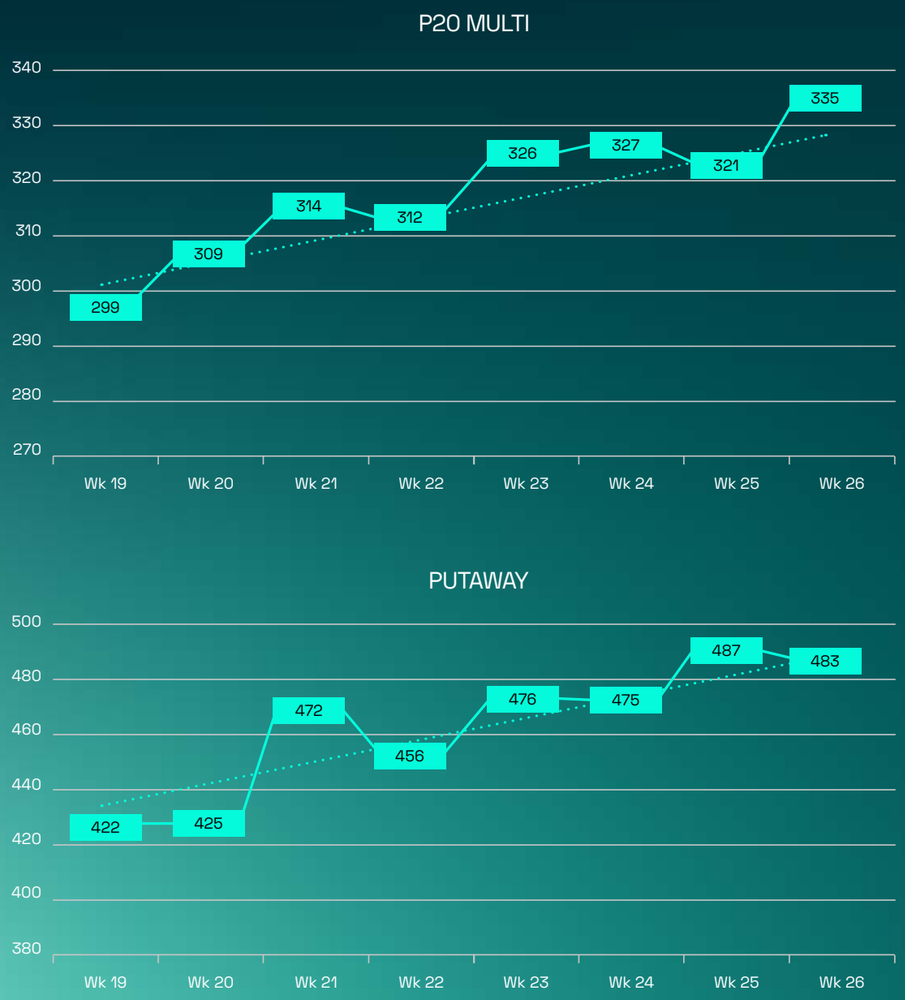
And year 3 an aditional 23% on the fixed baseline from.

23%↓

In summary, combined improvement of 77% during a period in which UK labor rates rose by 30%. The system paid back 3x over during that period.

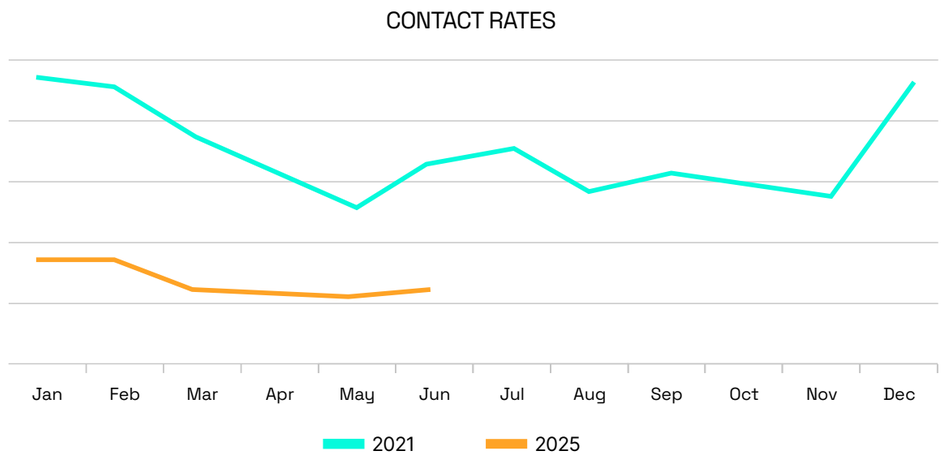
Labour Rates: Geek+

The Geek+ post commissioning optimisation has been more complex reflecting different product types and configurations required at inbound and outbound ports. At the time of this article, we have been operating at high 90s% availability having been optimising these configurations for the last seven months. Particular areas of focus have been Pick to Order Multi item orders and also Put-away efficiency in Inbound. The graphs below demonstrate the impact that we have made in a seven week period up to this whitepaper publishing, both via a reconfiguration at the port, with a 12% and 14% improvement over this period. Operating costs are currently running at a 37% reduction on the baseline cost.



Customer Contact Rates:

A consequence of faster and more accurate processing is that contact rates have also fallen dramatically over the same period, by 59% in the year-to-date vs the baseline year.



Service Levels:

AutoStore

Following the stabilisation of the system, we extended the cut off time for Next Day premium Delivery to 12 Midnight. A year later, this was then further extended to 1am. This time is not matched by any other operational service provider in the UK. This is made possible by a number of factors:

- Speed of processing from receipt of order, fraud check, batching and pick pack/dispatch;
- SKU accuracy and quality of location is high, meaning items are where they should be in a good condition;
- Automated systems maximize pick accuracy;
- Space efficiency means that all inventory is in a pick location with zero replen from bulk storage.

Geek+

Very similar metrics in this system for exactly the same reasons:

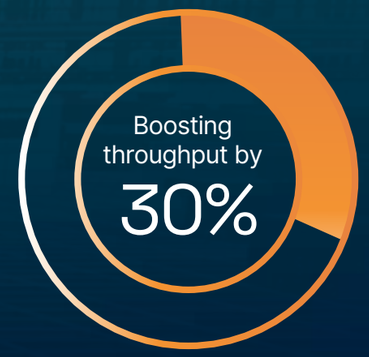
- Speed of processing from receipt of order, fraud check, batching and pick pack/dispatch;
- SKU accuracy and quality of location is high, meaning items are where they should be in a good condition;
- Automated systems maximize pick accuracy;
- Space efficiency means that all inventory is in a pick location with zero replen from bulk storage.

AutoStore

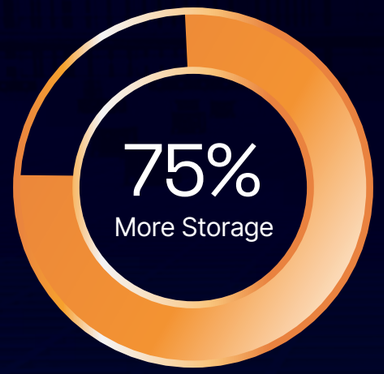
Continuous Improvement Framework

Put-away Strategies and Impact

Put-away processes have been continuously refined each year. Initially focused on speed, we shifted to strategies based on SKU velocity and pick frequency. Distributing fast-moving products evenly across the grid has cut pick times and robot contention, boosting throughput by 30%.



The current put-away logic prioritizes filling partially used bins, starting with those having one empty compartment, to reduce fragmentation and increase utilization. For stock processed through the returns or amnesty process, a refill strategy places items into bins already containing the same SKU, preventing inefficient use of bin space and maintaining high utilization.



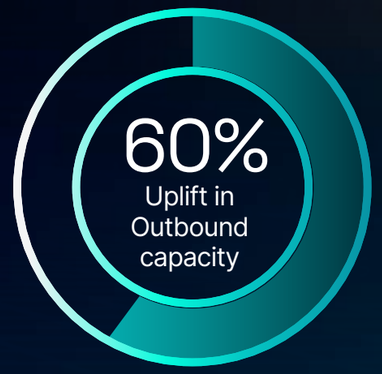
Dig Depth :

As SKU count doubled through new client onboarding, dig depth naturally increased. Early performance drops triggered a full review of product placement, grid layout, put-away, and workflow. Optimizing these, including pick strategies and bin configurations, reduced dig depth by 32% in core zones.

Dig depth, the average bins a robot must move to reach a target, currently averages 0.7 bins. Fast-moving SKUs stay near the top, but spreading high-frequency items across too many bins raises dig depth and robot workload. We continue refining placement to balance digging efficiency with order availability and speed.

Bin Configuration Strategy and Impact :

We began with standardized 1- or 4-compartment bins but soon found mixed configurations more effective. Using volumetric data to match bin sizes to SKU dimensions and turnover, we maximized utilization and reduced dig depth. This improved space efficiency, adding 75% more storage locations to support growth without expanding the grid footprint.



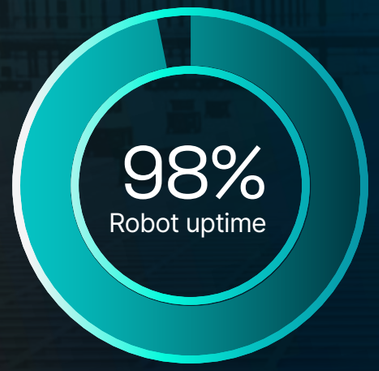
Pick Strategy :

The Warehouse Control System (WCS) actively selects which bins to pick from based on multiple criteria, including order urgency, bin accessibility, and SKU location. Pick strategies are dynamically adjusted to suit different conditions. During peak periods the focus shifts to prioritizing speed and throughput, while out-of-peak times allow for more balanced picks to optimize robot travel and system wear.

Batching:

Batch picking remains key during peak periods like Singles Day and Black Friday, delivering a 120% throughput increase over pick-to-pack operations. However, it requires temporary processes and more agency labor, causing efficiency trade-offs and recurring cost spikes each November.

To handle high volumes better, we expanded batching with automated pickwaves that smartly group and prioritize orders, enabling timely fulfillment without manual intervention. This has significantly boosted system throughput and robot utilization, driving a 60% uplift in outbound capacity during peak weeks.

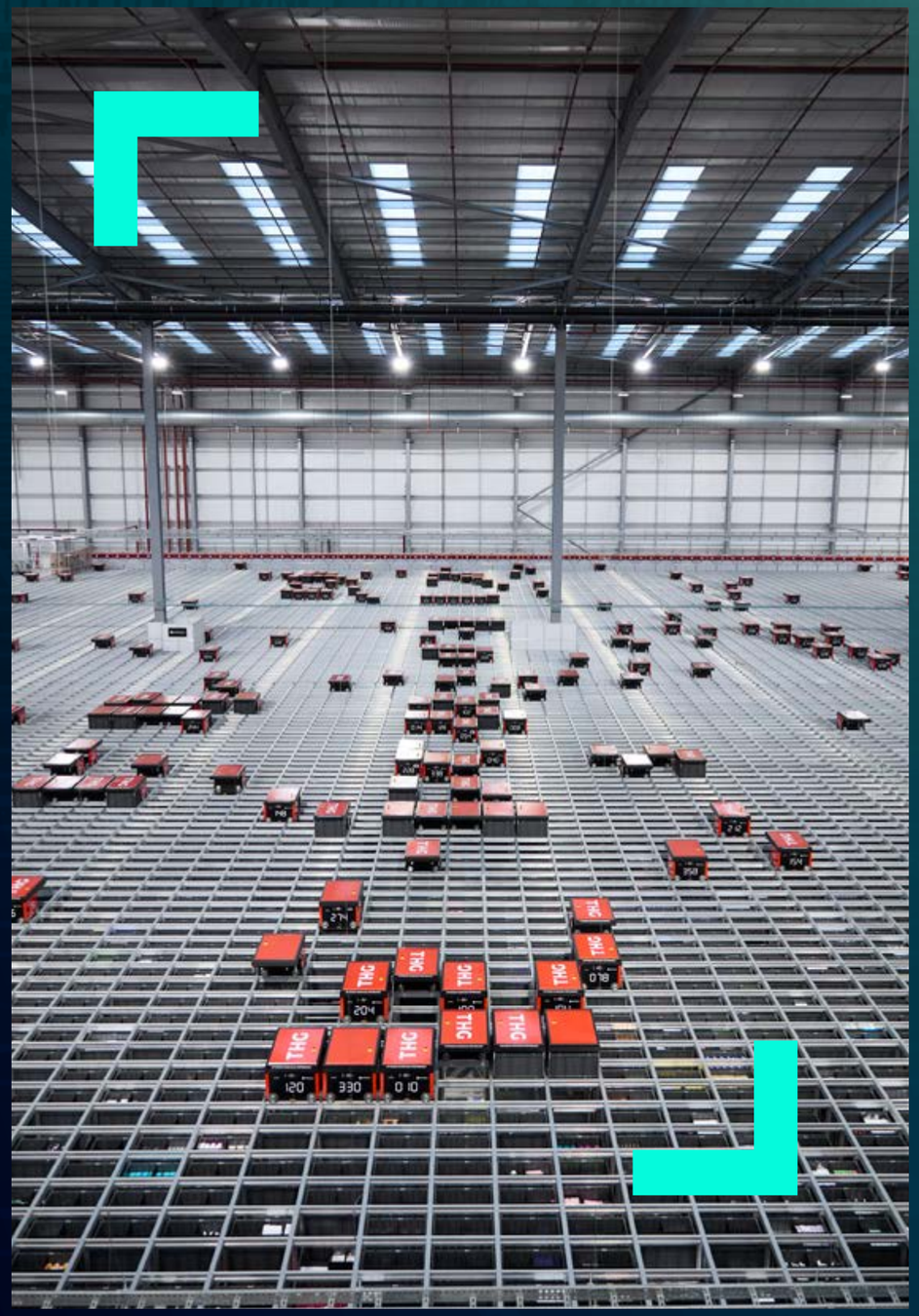


Charging Strategy:

Robots top up their charge opportunistically during natural pauses in activity, an approach that was adopted to eliminate scheduled downtime and has allowed continuous operation even during peak periods. This charging strategy, combined with a deep cycle function that prolongs battery life and maintains overall battery health, proves highly effective in balancing energy levels across the fleet. As a result, robot availability has increased, idle time has decreased, and operational flow runs more smoothly, particularly during extended high-volume trading windows.

Robot Uptime:

Robot uptime has consistently remained above 98%, even during peak trading periods. A proactive preventative maintenance program was introduced early in the operation, supported by continuous monitoring of robot diagnostics and performance metrics. Quick-response protocols and the availability of spare units ensure that any disruptions are resolved swiftly. Despite the system aging after three years of operation, uptime has remained unaffected, demonstrating the robustness and resilience of both the hardware and maintenance strategy.



Continuous Improvement Framework

Pick Waves

Within Geek+ we have multiple waves that offer the ability to have more custom picking dependent on a client's needs. These waves allow for different pick and different pack behaviours to be applied. For example, we have a pick to order wave and pick to batch wave. These have different pick strategies: Pick to Order goes into a Pick2Light Rebin wall, while Pick to Batch goes into a large container with mixed orders. The Waves also allow us to separate workstations according to clients this maximizes our efficiency and aids cost further.

Storage racks config:

Geek+ allows for customisation of the pods/racks used to store and present a client's stock the two standards types that we currently operate the system with; a rack with 5 shelves and 5 locations on each shelf, used for small to medium SKU's.The pallet bases are used for heavy or large SKU's; an example being bulky bags of dog food and multipacks of carbonated drinks. Currently we have designed and tested a hybrid rack that will have the ability to have the lower section of a pallet base with two shelves on top allowing for more storage opportunity and maximizing the space of the system. Having the ability to customise the pods/racks means that the storage location can be custom fit to the client, thereby finding the most efficient design best suited for storing the units safely and picking them out efficiently.

Pack bench config:

The pack benches have been placed directly behind the roller buffers used to pass the TSUs with a completed picked order reducing transport times for TSUs and decreasing the time between orders being picked and packed. Our Workstation layout is setup to be dedicated to a client's needs.

Inbound/put-away:

Geek+ inbound has had constant improvements from allowing for more density in locations with put-away override function and increased traceability of inbounded products with transactional feedback at put-away. Something we needed to address was the low unit fill at put-away due to a Unit suggestion. Put-away override allows the user to fit the maximum number of SKUs they can fit into that location and override the suggestion this function increased the unit fill of locations drastically. Tracking put-away, initially the Geek+ system would only tell our WMS when the put-away had started and would then only tell us what has been put-away once the task was complete. To improve traceability the Geek+ system now sends a message after every transaction, meaning if put away is paused due to a break we can see this due to the transactions' time stamps. Consolidation within the Geek+ system allows us to create tally plans based off required filters. A tally plan can be created with a specific client's stock that has a unit fill >50%. This tally plan will then allow this stock to be taken out the system and placed back into the system in locations that either has the existing SKU or a new location to generate higher unit fill which then further increases the efficiency at pick.

05.

What's Next for Automation at THG Fulfil?

Our AutoStore Distributor Partnership

Our success with AutoStore technology has evolved into a strategic distributor relationship, enabling THG Fulfil to offer comprehensive automation solutions to other businesses. This partnership leverages our practical implementation and optimization experience to guide clients through their own transformation journeys.

Service offerings:

Implementation support:
Project management and change management expertise.

Feasibility assessments:
ROI analysis and system design consultation.

Training and optimization:
Best practices sharing and performance tuning.

Ongoing support:
Maintenance, upgrades, and continuous improvement services.

Advanced Technology Integration with our Libiao Partnership

Our collaboration with Libiao expands our automation portfolio with complementary technologies that address specific operational requirements:

Sortation optimization:
Advanced sorting algorithms for complex order profiles.

Multi-channel fulfillment:
Integrated solutions for B2B, B2C, and retail replenishment.

Vertical integration:
End-to-end automation from receiving through shipping.

Cross-docking efficiency:
Streamlined processing for fast-moving inventory.

Emerging Technology Evaluation

We continuously assess new technologies for integration potential:

Artificial intelligence:
AI and machine learning algorithms for predictive maintenance, demand forecasting, and dynamic inventory management.

Computer vision::
Enhanced quality control and inventory verification capabilities.

IoT sensors:
Environmental monitoring and predictive analytics expansion.

Blockchain integration:
Supply chain transparency and traceability enhancement

And Finally, Our Long-Term Vision:

The Autonomous Fulfillment Center - Fully Integrated Operations

Our roadmap envisions comprehensive automation across all fulfillment processes:

01. Receiving automation:
Automated unloading, inspection, and put-away systems.

02. Inventory optimization:
Dynamic inventory management systems that continuously optimize stock levels and warehouse layouts.

03. Order orchestration:
AI-powered order routing and optimization.

04. Packaging automation:
Right-sized packaging and automated packing systems.

05. Shipping integration:
Seamless carrier selection and dispatch processing.

And Finally, Our Long-Term Vision:

Sustainability Leadership

Sustainability is becoming a central component of automation strategies, as companies strive to reduce their environmental impact while maintaining operational efficiency. Our future developments prioritize:

Energy efficiency:

AutoStore's electric-powered robotic fleet consumes less energy compared to traditional warehouse equipment.

Waste reduction:

Optimized packaging and reduced return rates.

Carbon footprint:

Local fulfillment capabilities to minimize transportation impact.

Circular economy:

Enhanced returns processing and refurbishment capabilities.

Market Expansion Strategy

Our automation expertise supports geographic and vertical market expansion:

Replicable model:

Standardized implementation approach for new facilities.

Industry specialization:

Customized solutions for specific vertical requirements.

Partnership ecosystem:

Strategic alliances with technology providers and system integrators.

Thought leadership:

Knowledge sharing through industry

06.

Conclusion Leading the Future of Fulfillment

THG Fulfil's automation journey demonstrates that strategic technology implementation can transform operational performance while enhancing workplace satisfaction and client relationships. Our automation capabilities position THG Fulfil as an industry leader prepared for future commerce demands. As warehouses embrace automation and connected systems, companies that position themselves now can lead in efficiency, customer satisfaction, and profitability.

Our experience validates that automation is more crucial than ever as companies face rising labor costs, increasing consumer demand, and supply chain disruptions.

Based on our own experience, we'd advise the following critical success factors for brands and retailers at the start of their automation journey:

01. **Strategic alignment:** Technology decisions driven by business objectives, not technology trends.

02. **Phased implementation:** Risk mitigation through incremental deployment and validation.

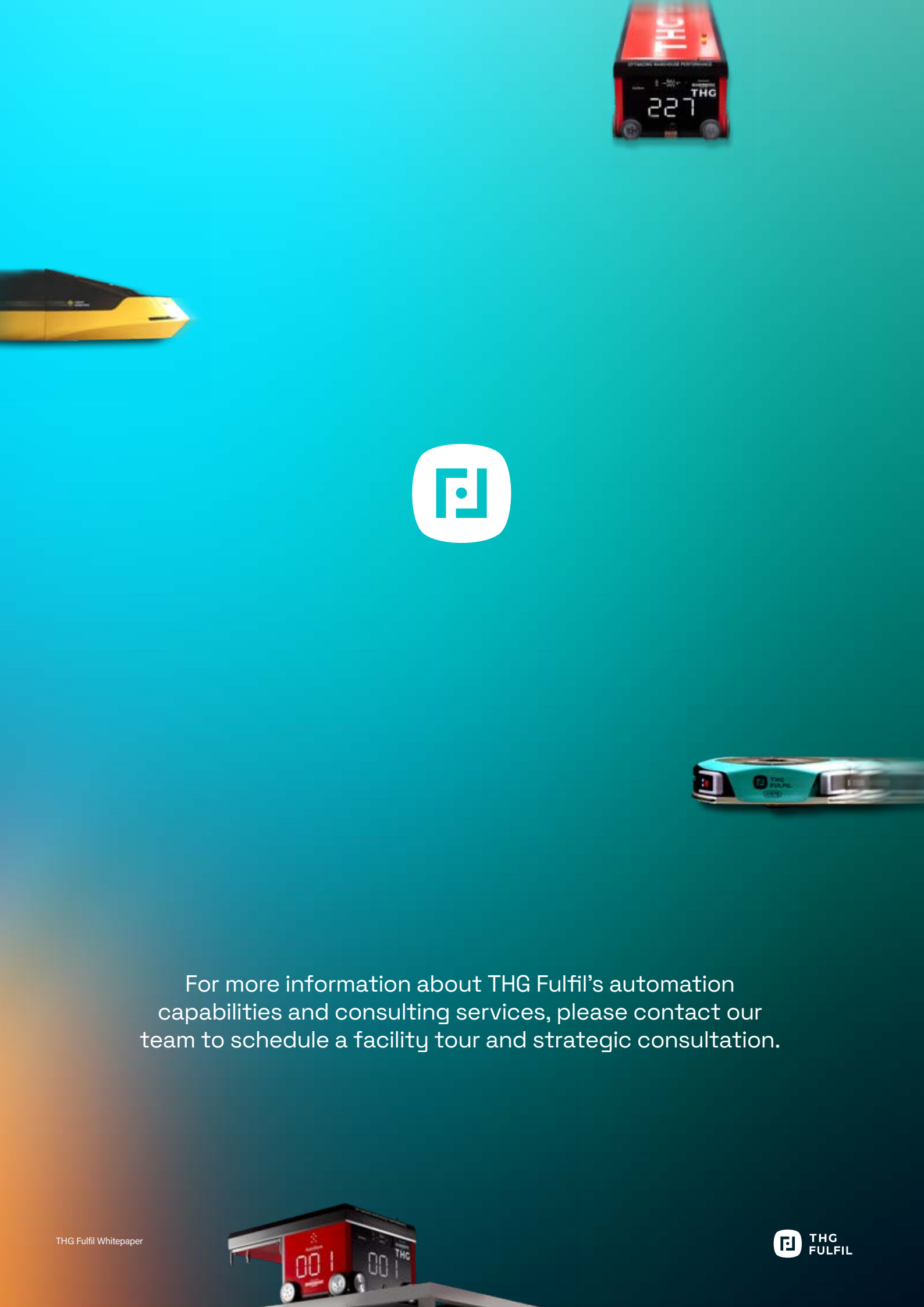
03. **Cultural transformation:** People-first approach that enhances rather than replaces human capabilities.

04. **Continuous optimization:** Data-driven improvement cycles that maximize technology investment.

05. **Partnership approach:** Collaborative relationships with technology providers and clients.

For businesses considering automation, our experience demonstrates that success requires more than technology acquisition. It demands strategic vision, operational excellence, and cultural commitment to continuous improvement. THG Fulfil stands ready to share our expertise and support other organizations in their transformation journeys.

The future of fulfillment is automated, intelligent, and sustainable. Through strategic investment in advanced technologies and operational excellence, THG Fulfil is not just participating in this future, we're helping to define it.



For more information about THG Fulfil's automation capabilities and consulting services, please contact our team to schedule a facility tour and strategic consultation.

THG FULFIL