

The Right Equipment for the Right Warehouse



Procurement and Supply Chain Management Made Simple.

Foreword

Warehousing has always depended on movement. Goods must be received, transferred, stored, retrieved, picked and dispatched, often within narrow time windows and increasingly complex buildings. Mechanical Handling Equipment (MHE) provides the physical link between these activities, but selecting it is far more demanding than choosing a forklift or pallet truck. Modern warehouses can combine conventional vehicles, conveyors, automated storage, autonomous robots and sophisticated control systems within the same operation.

The commercial implications are equally significant. Equipment choices affect labour requirements, storage density, energy consumption, maintenance expenditure, safety performance and the amount of capital tied up in the warehouse. A relatively inexpensive manual solution may offer excellent value in one operation, while another may justify substantial automation because volume, travel distance or labour intensity makes conventional methods increasingly uneconomic. Technology becomes valuable only when it solves a clearly defined operational problem.

Automation has widened options without diminishing the importance of established equipment. Automated Guided Vehicles (AGVs), Autonomous Mobile Robots (AMRs) and robotic handling systems can transform repetitive activities. Yet, counterbalance forklifts, reach trucks, pallet trucks and order pickers remain indispensable across United Kingdom (UK) warehousing. The strongest operations increasingly combine technologies, assigning automation to predictable, high-volume movements while keeping flexible equipment and human judgement where demand, loads or operating conditions vary.

Selection therefore needs to begin with evidence. Load weight, dimensions, travel distance, throughput, aisle width, lift height, operating hours and peak demand should determine the technical requirements before suppliers or specific machines are considered. Purchase price is only part of the equation. Energy, batteries, maintenance, training, statutory examination, software, integration, charging infrastructure and eventual replacement can materially alter the Total Cost of Ownership (TCO) over the equipment's working life.

The central question is consequently not which technology is newest, fastest or most automated, but which combination provides the safest and most economically sustainable material flow. Successful investment balances productivity with flexibility, capacity with resilience and automation with operational reality. When equipment is selected around the warehouse, rather than the warehouse being forced around the equipment, mechanical handling becomes more than a collection of machines; it becomes a strategic component of supply chain performance.

Selecting MHE in Warehousing

Selecting MHE in warehousing starts with the required movement, not the machine that happens to be available. Pallets, cartons, totes, long loads and individual items create different demands for capacity, travel distance, lift height and control. A low-cost pallet truck may suit short horizontal moves, while high-throughput storage may justify conveyors, reach trucks or automated systems designed around repeatable flows. The movement profile should therefore be documented before any equipment is shortlisted.

The commercial decision can range from a few hundred pounds to a multimillion-pound capital programme. A manual pallet truck can cost less than £200, a new electric counterbalance forklift can exceed £35,000, and automated storage is normally priced project by project because building works, software, controls, conveyors and commissioning materially affect total investment. The breadth of that range explains why procurement discipline matters as much at the bottom of the market as at the top.

Selection therefore requires a whole-life perspective. Purchase price sits alongside operator wages, employer National Insurance, energy, servicing, tyres, batteries, statutory examinations, downtime, training and eventual disposal. Over a typical working life, these recurring costs can outweigh the original purchase price, particularly where equipment runs across multiple shifts. Equipment that saves labour time, protects stock or postpones a building extension can therefore be worth far more than its initial specification suggests.

What Counts as MHE?

MHE covers machinery and devices used to move, lift, position, store or retrieve materials in the workplace. In warehousing, the category ranges from hand pallet trucks and powered stackers to counterbalance forklifts, reach trucks, conveyors, cranes and automated storage technologies. The common purpose is to replace or reduce manual effort, control movement more reliably and match handling methods to the physical characteristics of goods, loads and buildings, rather than relying on strength and repeated walking.

MHE can be mobile, fixed or automated. Mobile equipment includes pallet trucks, forklifts, reach trucks and order pickers that travel to the load. Fixed systems include powered conveyors, hoists and cranes that move goods along predetermined paths. Automated systems reverse the traditional relationship by bringing goods to people or moving them without continuous driver control. These distinctions matter because flexibility generally reduces as infrastructure becomes more fixed, while potential throughput and consistency often increase.

The Health and Safety Executive (HSE) expressly recommends mechanisation where hazardous manual handling can be avoided. Its guidance identifies conveyors, chutes, pallet trucks, hoists and lift trucks as examples of mechanical aids. The Manual Handling Operations Regulations 1992 require employers to avoid hazardous manual handling where reasonably practicable, assess unavoidable operations and reduce the remaining risk as far as reasonably practicable. Equipment selection is therefore both an operational and a risk-control decision.

Not every device falls under identical legislation. The Provision and Use of Work Equipment Regulations 1998 (PUWER) apply broadly to workplace equipment, requiring it to be suitable, maintained in safe condition, inspected where necessary and supported by adequate information, instruction and training. The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) additionally apply to qualifying lifting equipment, so classifying each item correctly determines its inspection and thorough-examination duties from the outset.

Why MHE Matters in Modern Warehousing

Warehousing depends on movement as much as storage. Every receipt, replenishment, pick, consolidation and dispatch creates handling activity, and poorly designed movement consumes labour without adding value. MHE can shorten travel, reduce lifting, increase storage height and make throughput more predictable. Its importance grows as warehouses

handle growing Stock Keeping Unit (SKU) ranges, tighter delivery cut-offs, seasonal peaks, or labour shortages that make purely manual processes increasingly difficult to scale.

Workforce size strengthens that case. Research for the UK Warehousing Association, published in June 2026, estimated that around 760,000 people work in UK warehousing, more than 70% above the Office for National Statistics figure of about 440,000. Even on official figures, warehousing jobs have grown 40% since 2011, compared with 14% for employment overall. Every reduction in unnecessary travel or lifting therefore applies across a very large and expanding workforce.

Safety is equally significant. Employers reported 59,219 non-fatal injuries to employees under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR) in 2024/25, with handling, lifting or carrying accounting for 17% and slips, trips or falls for 30%. The Labour Force Survey estimated that 680,000 workers sustained a self-reported non-fatal workplace injury in the same year. Mechanical aids directly target the handling share of that burden.

The safety case is not simply to replace people with machines, because MHE introduces hazards of its own. Lift trucks create collision, overturning, and falling-load risks; conveyors create trapping and entanglement hazards; cranes introduce suspended-load risks; automation creates new interfaces between people, controls, and moving equipment. HSE therefore emphasises separating pedestrians and vehicles, providing suitable routes and safe loading areas, and maintaining and using equipment competently, rather than assuming mechanisation automatically creates a safer warehouse.

Well-designed capacity supports public services as much as commercial operations. National Health Service (NHS) Supply Chain's Gorsey Point distribution centre in Widnes, fully operational from 2024, covers 400,000 square feet, about three times the Runcorn warehouse it replaced. Pallet spaces rose from 7,500 to 60,000, serving 115 NHS trusts, 3,500 delivery locations and 18,400 requisition points. Storage at that scale works only when equipment, racking, and layout are designed as a single system.

Understanding the Material Handling Requirement

A credible equipment specification starts with the load. Decision-makers should establish maximum and typical weight, dimensions, centre of gravity, packaging strength, pallet type, load stability and any temperature, hygiene or hazardous-material requirements. A truck's nominal capacity may reduce at greater lift heights or with altered load centres, while long, fragile or uneven goods may require attachments or specialist equipment. Average load data alone is therefore an unsafe basis for selection.

The second requirement is movement. Analysts should map origins, destinations, daily volumes, peak-hour flows, travel distances, queue points and empty running. A process moving ten pallets each hour over 20 metres has different economics from one moving 200 pallets across several hundred metres. Repetitive, high-volume routes favour conveyors or automation; irregular destinations favour mobile equipment. Measuring actual journeys prevents expensive technology being purchased for activity that represents only a small proportion of warehouse labour.

Warehouse geometry is equally decisive. Clear height, column spacing, aisle width, rack depth, floor loading, gradients, door dimensions and marshalling space can determine which equipment is physically viable. Very narrow aisle and high-bay equipment also depends on floor flatness and racking tolerances that older buildings may not meet. A building survey should therefore precede any shortlist, because the structure shapes achievable storage density as much as the racking itself.

Throughput should be tested at peak rather than average demand. A system that comfortably meets ordinary volume may fail during Christmas, promotional events, emergency demand or public-sector surges. Required moves per hour should include replenishment, returns, waste,

battery changes and congestion, not simply outbound picks. Sensitivity analysis can compare one-shift, two-shift, and 24-hour operations to determine whether additional equipment, spare capacity, or temporary rental is more economical than permanent capacity for short peaks.

Public and private warehouses can weight identical criteria differently. Retailers may prioritise speed, seasonal scalability and unit cost, while healthcare operations emphasise resilience, traceability and continuity. NHS Supply Chain operates eight distribution centres across England and supplies more than 35 million healthcare products annually. In 2025, it awarded GXO a seven-year logistics contract, reported to be worth about £1.9 billion, with an optional three-year extension, illustrating the scale at which public-sector handling decisions are made.

Finally, the business case should compare TCO rather than headline price. Capital cost, finance, energy, maintenance, statutory examination, operator training, battery replacement, software licences, integration, floor or racking modifications and downtime all matter. Residual value and contract flexibility also affect the economics, because hire, lease and outright purchase can produce very different answers for identical handling tasks, depending on utilisation, contract length and the organisation's appetite for long-term capital commitment.

Manual and Powered Pallet Trucks

Hand pallet trucks are among the simplest warehouse handling devices, using hydraulic forks to raise a pallet just enough for horizontal movement. They suit short distances, loading areas, retail backrooms, and low-frequency work where powered equipment isn't necessary. Current UK pricing demonstrates their accessibility: Handling Equipment UK lists a 2,500-kilogram model from £189 plus Value Added Tax (VAT) and a 3,000-kilogram heavy-duty version at £462 plus VAT.

Powered pallet trucks add electric traction and, in some configurations, ride-on platforms, reducing physical effort and improving productivity over longer routes. Toyota currently lists its 1.5-tonne lithium-ion BT Tyro pallet truck at £1,277, while automated pallet transport extends the concept much further: Handling Equipment UK advertises a 1.5-tonne autonomous pallet truck from £13,000 plus VAT. The price spread shows how seemingly similar equipment can meet fundamentally different labour and throughput requirements.

Selection should consider distance, gradients, floor condition, turning space, pallet quality and daily utilisation rather than capacity alone. HSE states that simple pallet trucks that only raise loads clear of the ground are generally outside LOLER, whereas high-lift manual or powered pallet trucks that can raise forks above 300 millimetres fall within its scope. PUWER still applies to every workplace pallet truck, so maintenance, inspection, suitability and training remain necessary regardless of lifting classification.

Counterbalance Forklift Trucks

Counterbalance forklifts remain the general-purpose workhorses of many warehouses because the rear counterweight lets forks approach loads directly, without support legs extending beneath the pallet. They can unload vehicles, move pallets across yards, feed production and place goods into racking. Electric models suit many indoor operations, while liquefied petroleum gas (LPG) or diesel variants remain relevant where duty cycles, outdoor conditions or load requirements justify them, subject to ventilation and emissions controls.

Their flexibility carries a space penalty. Counterbalance trucks generally need wider operating aisles and more turning room than reach trucks or very narrow aisle equipment, so a cheaper truck can indirectly increase building cost by reducing rack density. Capacity also changes with mast height, load centre and attachments. Buyers should therefore review residual capacity charts, not just the nominal rating, especially when clamps, rotators, double-deep forks or long loads shift the centre of gravity forward.

Current used-equipment prices show the scale of investment but do not imply a universal market rate. Impact Handling recently listed a 2017 Cat GP25N LPG counterbalance forklift, derated to 2,400 kilograms, at £11,475, while another used Cat counterbalance was

advertised at £12,950 plus VAT. Contract hire can be preferable where utilisation is predictable because it bundles servicing and replacement, transfers some maintenance risk and avoids a large upfront capital payment.

Legal controls are substantial. HSE confirms that forklifts used for lifting are subject to LOLER, with forks, chains, mast and lifting mechanisms normally requiring thorough examination at 12-month intervals unless a written scheme specifies otherwise. PUWER also requires maintenance and appropriate inspection, including routine pre-use checks. Operators must be adequately trained, and warehouse layouts should separate pedestrians from vehicles wherever possible because moving vehicles remain a leading cause of fatal workplace injury.

Reach Trucks and High-Level Warehouse Operations

Reach trucks are designed principally for pallet storage in racking, combining a compact chassis with a mast or fork carriage that reaches forward to place and retrieve loads. Their smaller turning envelope allows narrower aisles than counterbalance trucks, increasing pallet positions within the same building. They are therefore especially valuable where storage density and vertical utilisation matter more than frequent outdoor travel, although specialist models can bridge some traditional indoor-outdoor limitations.

Modern lift heights are substantial. Toyota says its BT Reflex reach-truck family covers capacities from 1.4 to 2.5 tonnes and lift heights to 13 metres. Linde lists an R14X HL configuration with a 12,755-millimetre lift and an aisle requirement of about 3,127 millimetres for a standard 800 by 1,200-millimetre pallet. Such figures show why truck, rack and building design should be engineered together rather than purchased in isolation.

Higher lift capability does not mean full nominal capacity remains available at maximum height. Residual capacity depends on mast configuration, load centre, attachment weight and lift height, while visibility and mast deflection become important. Camera systems, lift-height selection, load indicators and assistance technologies can reduce operator workload, but they do not replace engineering calculations. A warehouse redesign that adds another rack level may therefore require different trucks, not just taller masts.

Reach trucks also illustrate the trade-off between capital cost and density. Toyota's approved-used reach-truck listings cover equipment lifting roughly 5.4 to 12 metres, with advertised search ranges extending to £35,000. Impact Handling has listed a used Cat reach truck at £15,800 plus VAT and a refurbished example at £22,380. These figures should be weighed against the value of additional pallet positions, reduced travel and any building expansion that denser storage may postpone.

Real operations show why mixed fleets are common. Lemonpath Contract Packing & Logistics selected six gas counterbalance forklifts and six electric reach trucks under a long-term hire arrangement, pairing dock and general handling with racked storage. J.O. Sims similarly adopted a fleet combining reach trucks, electric counterbalance trucks and powered pallet trucks. Both examples underline a central principle: different warehouse movements justify different equipment, rather than forcing one truck type to perform every task.

Order Pickers, Stackers and Specialist Warehouse Trucks

Order pickers retrieve individual cases or items rather than move complete pallets. Low-level machines speed up horizontal picking, while medium- and high-level variants raise the operator or picking platform to storage locations. They become attractive where case-pick volumes are high, and walking dominates labour time. Because the operator interacts directly with stock at height, platform design, fall protection, aisle control and picking ergonomics become as important as travel speed or rated capacity.

Stackers occupy the space between pallet trucks and larger forklifts. Pedestrian or ride-on models can transport pallets and place them into low or medium-level racking without the footprint or cost of a conventional counterbalance truck. Jungheinrich currently lists a 1,200-kilogram pedestrian stacker at £2,380 with lift heights up to 3,530 millimetres, while Toyota

lists a 1,000-kilogram lithium-ion stacker at £3,295 with a 3,600-millimetre lift, illustrating their relatively accessible price point.

More capable stackers can reach materially higher. Jungheinrich's ERC 214zi and ERC 216zi range handles 1,400 to 1,600 kilograms and can stack to six metres, while its double-deck capability allows two pallets to be moved together. Such equipment can increase throughput without requiring a full reach-truck specification, but the application must still be tested for pallet type, aisle width, gradients and travel distance. Pedestrian operation becomes less attractive as journeys lengthen.

Specialist trucks solve geometry that conventional machines handle poorly. Very narrow aisle trucks can work within tightly spaced racking and exploit greater building height, while four-way reach trucks travel sideways with long loads such as timber or steel. Linde's R20–R25 F range, for example, carries up to 2.5 tonnes, lifts to 9.65 metres and accommodates fork widths up to two metres. These capabilities can eliminate wide turning areas otherwise required for long products.

Towing tractors, platform trucks, and double-stack machines offer further alternatives when the load isn't best treated as a single pallet. Tugger trains can move several carts on scheduled routes, separating transport from loading and unloading activity. In manufacturing or healthcare logistics, this can support predictable milk-run replenishment. The right comparison isn't always forklift against forklift; it may be forklift against tugger, stacker, conveyor, or autonomous transport, depending on flow frequency and handling points.

The strongest case for specialist equipment emerges when an organisation quantifies a specific constraint. Tiger Trailers, for example, received two 3.5-tonne electric counterbalance forklifts and a 2.5-tonne electric reach truck from Impact Handling to support its Winsford manufacturing operation. Polypipe previously specified 17 2.5-tonne forklifts with a mixture of specialist fork arrangements for long pipes and double-deep stacking. Tailoring attachments and truck types to the load can be more valuable than simply increasing rated capacity.

Conveyor Systems

Conveyors move cartons, totes, pallets or components along fixed routes using rollers, belts, chains or other driven mechanisms. They excel where flow is repetitive, destinations are stable and sustained throughput justifies dedicated infrastructure. Unlike a forklift, a conveyor does not need an operator for every movement, but it occupies floor or overhead space and can limit future layout changes. The strongest applications therefore combine predictable volume with processes unlikely to be relocated frequently.

Real installations show how tailored these systems can be. Spaceguard supplied a UK personal protective equipment warehouse with a 20-metre, 500-millimetre-wide stainless-steel belt conveyor, plus a rotary table for totes and boxes. Another project for a packaged-snacks producer included a 10-metre belt conveyor, a powered roller bend and a gravity roller section integrated with packing benches. Neither solution was a simple equipment purchase; each was designed around workflow, hygiene, workstation positioning and product characteristics.

Conveyors are work equipment under PUWER and require guarding, safe isolation, emergency stops and hazard-appropriate maintenance. Many ordinary conveyor systems are not treated as lifting equipment under LOLER, but that does not reduce the employer's duty to control trapping, crushing and entanglement risks. A financial evaluation should include controls, guarding, installation, electrical work, access platforms, integration and downtime during commissioning, not just the cost of the conveyor modules themselves.

Cranes, Hoists and Overhead Handling Systems

Cranes and hoists become appropriate where loads are too heavy, awkward or specialised for conventional warehouse trucks, or where floor space must remain clear. Overhead bridge cranes, gantry cranes, jib cranes and electric chain hoists can move machinery, steel, dies, bulk bags or maintenance components within defined zones. Their major advantage is vertical

handling without permanent vehicle traffic on the floor, although coverage, structural support and lifting speed must match operating requirements.

Costs vary sharply with capacity and structure. As a simple reference point, not a complete crane-system price, UK-market one-tonne electric chain hoists can be listed at roughly £1,460 to £3,690, depending on voltage, speed and specification. A complete overhead crane costs substantially more because it adds runway beams, structural assessment, power supply, controls, installation, testing and access arrangements. Comparing only the hoist price would therefore materially understate the investment required.

LOLER is central to crane and hoist operation. HSE requires lifting equipment to be adequately strong and stable, properly positioned, marked with its safe working load and used in properly planned lifting operations carried out by competent people. Thorough examination is required at prescribed intervals or under a written scheme, with defects recorded and reported. Chains, slings, hooks and lifting beams also form part of the lifting system and require appropriate control.

Overhead handling can reduce forklift interaction but introduces the risk of suspended loads. People should not be unnecessarily exposed beneath loads, and lifting plans must consider attachment points, load balance, travel paths, and potential collisions with racking, services, or structures. For public-sector workshops, utilities, manufacturing plants and engineering stores, cranes can provide essential capability, but utilisation needs careful assessment: a heavily engineered system used only occasionally may be less economical than specialist hire.

Automated Storage and Retrieval Systems (AS/RS)

AS/RS use computer-controlled equipment to store goods and retrieve them when required. Technologies include pallet stacker cranes, miniload cranes, shuttle systems, vertical lift modules and cube-based robotic storage. The defining feature is not a particular machine but the integration of storage, movement and control. AS/RS can increase density and throughput substantially, but performance depends as much on software, interfaces, replenishment discipline and engineered redundancy as on the hardware itself.

The investment case is strongest where high volume, constrained space, labour intensity and predictable processes occur together. UK automation suppliers generally price AS/RS by project because storage capacity, throughput, building geometry, fire strategy, conveyors, software and integration differ materially between sites. Capital cost should therefore be assessed through lifecycle cash flow and return on investment rather than a generic price per robot or storage location, with realistic allowances for maintenance and technology obsolescence.

The Ministry of Defence provides a major public-sector example. Its £83 million Defence Fulfilment Centre at Donnington opened in 2017 with 80,000 square metres of space to support storage and distribution from an inventory then valued at £30 billion. The site's AS/RS was designed to pick more than 1,000 items an hour, while the wider transformation was expected to deliver around £500 million in savings by 2028.

THG provides a substantial private-sector comparison. At its Manchester fulfilment centre, THG completed an AutoStore installation with 256 robots and more than 300,000 bins in about five months, and AutoStore reports that the fleet has since grown to 380 robots. The system can hold up to 1.2 million units and supports up to 500,000 daily shipments. Sustained high volume made intensive automation commercially credible, as the financial results discussed later confirm.

Arvato's Hams Hall operation near Birmingham demonstrates modular expansion. Its AutoStore system grew from 65,000 to 87,600 bins and from 130 to 165 robots, lifting storage capacity to about 1.2 million units. The expanded system supports more than 26,000 orders and 90,000 outbound units at peak each day, and the 2025 expansion took just over three

months, showing how scalable automation can extend an existing warehouse without relocation.

Driverless Pallet Movement and AGVs

AGVs move materials without a continuously present driver, typically following defined routes controlled by software, laser navigation, reflectors, magnetic guidance or comparable technologies. They suit repetitive pallet movements between receiving, storage, production and dispatch, where origins and destinations change little. Compared with manually driven trucks, AGVs trade some improvisational flexibility for repeatability, traceability and predictable availability, making process discipline a key prerequisite for successful deployment.

Primafruit provides a useful UK example. At its Vale of Evesham operation, seven Toyota Autopilot counterbalance AGVs move fresh fruit from goods-in to chilled storage, then to packing lines and finally to dispatch. Each automated truck has a 1.2-tonne capacity and a 4.15-metre lift height. The application shows how AGVs can take over routine pallet transfers while manual trucks remain available for less predictable loading and exception-handling activity.

Bosch also introduced two AGVs at its Worcester operation after identifying excessive non-value-adding walking and pallet movement. Bosch reported that a line-feeding operative could walk around 14 kilometres on an average day. The battery-powered vehicles can each carry 500 kilograms and travel at up to two metres per second, showing how relatively modest automated vehicles can remove repetitive internal transport without requiring a fully automated factory or warehouse.

AGV economics depend on utilisation, route stability and integration rather than vehicle price alone. Toyota reports that Oda automated 98,000 pallet movements in four months using Swarm Automation, freeing 3,000 staff hours and raising efficiency in the automated area by 85%. These results are application-specific, but they show why managers should calculate avoided travel, labour hours, congestion and damage alongside capital, software, charging and maintenance costs.

AMRs and Goods-to-Person Fulfilment

AMRs differ from traditional AGVs principally in how they navigate and adapt. Rather than relying mainly on fixed or predefined paths, AMRs use sensors, mapping and fleet-management software to select or alter routes around obstacles. That greater navigational freedom is valuable in fulfilment environments where pick faces, demand patterns and pedestrian activity change frequently. AMRs can transport shelves, totes, cartons or pallets, depending on the platform and application.

Modularity makes AMRs particularly attractive where demand fluctuates. Organisations can often add units faster than they can extend fixed conveyors or major AS/RS infrastructure, provided wireless coverage, charging, traffic management and software capacity are adequate. Fleet size can usually be increased in small increments rather than through a single large capital commitment, and units can be redeployed between areas or sites as customer requirements change, which matters where growth is likely but uncertain.

A UK example is RangePlus in Croydon, where Geek+ and Breathe Technologies implemented a goods-to-person AMR system after rising online demand strained manual picking. Geek+ reported that the operation increased picking rate and reduced order-picking time by 300%, cut operating costs by 25% and stored 50% more separate product SKUs within the same space. The supplier also reported full payback on the investment in under two years.

AMRs can also alter labour design rather than replace labour. GXO reports that collaborative mobile robots working alongside employees deliver around twice the productivity of workers alone, while robotic goods-to-person systems can achieve four to five times the productivity in suitable operations. The improvement comes largely from removing unproductive walking and search time, keeping employees focused on picking, packing, replenishment or exception

handling, where human judgement remains valuable.

The flexibility has limits. AMRs still require clear operating rules, reliable floors, charging capacity, network resilience and disciplined interfaces with people, doors, conveyors and workstations. HSE guidance for routes shared by pedestrians and automatic vehicles calls for safeguards that keep the risk of collision injury low and provide enough clearance to prevent trapping. An AMR fleet should therefore be treated as an engineered transport system, not a collection of independent mobile devices.

Robotic Handling and Palletising Systems

Robotic handling systems automate physical tasks such as palletising, depalletising, case picking, sorting, unloading and packing. Industrial robot arms are especially effective where movements repeat at high frequency and product presentation is sufficiently controlled. Vision systems, Artificial Intelligence (AI) and improved grippers are extending their usefulness to less uniform cartons and parcels, but payload, reach, cycle rate, product fragility and gripping reliability must still be carefully matched to the application.

Palletising robots can reduce exposure to repetitive lifting while delivering consistent stacking patterns. Their value rises where production or inbound flow is continuous, pallets have defined destinations and manual handling would otherwise absorb several shifts of labour. Conversely, highly variable products may demand multiple end effectors, vision systems or manual intervention. A robot capable of rapid movement is not productive if upstream conveyors cannot supply products consistently or downstream pallet removal creates recurring stoppages.

GXO has piloted Dexterity AI-enabled robots that depalletise, label and repalletise packages, using machine learning to adapt to different items with limited setup. GXO presents such systems as a way to improve efficiency and safety while releasing employees for higher-value work. The case illustrates an important shift from traditional robots programmed for one tightly defined motion towards handling cells that can interpret variable loads and adjust their actions dynamically.

DHL Supply Chain provides another practical illustration. In July 2025, it announced £550 million of investment in UK and Ireland infrastructure and automation through to 2030, including the first UK deployment of Boston Dynamics' Stretch robot, which can unload up to 700 boxes an hour from containers. DHL describes the objective as reducing physical burden while improving efficiency, showing that robotic unloading now complements mobile picking robots and conventional trucks rather than replacing them.

International palletising examples help quantify potential performance. Mecalux reports that an anthropomorphic robot at Cabezuelo Foods can perform 150 movements an hour, equivalent to 1,350 boxes hourly in its configured application. Another Mecalux customer, Nupik, uses automated palletising that can handle up to 150 layers an hour and more than 1,000 boxes. These figures are not automatically transferable; product dimensions, layer patterns, gripper changes and availability materially affect achievable throughput.

Safety engineering remains fundamental. Robot cells commonly require guarding, interlocked access, emergency stopping, safe control systems and defined maintenance procedures. PUWER requires employers to ensure work equipment is suitable, maintained in a safe condition, inspected where necessary and used by adequately trained people. New machinery supplied for workplace use must also meet applicable product-safety requirements, and integration should preserve protective measures across robots, conveyors and associated machinery.

Comparing Load Characteristics and Handling Requirements

Load characteristics should determine equipment choice before throughput calculations begin. Weight, dimensions, centre of gravity, rigidity, packaging quality, pallet condition and load stability all affect what can be transported safely. A compact one-tonne pallet and a one-tonne

load of long steel sections impose very different requirements. Fragile cartons may tolerate conveyor movement but not aggressive acceleration, while unstable or overhanging loads may require clamps, side-shifters, specialist forks or slower travel speeds.

Unit-load format also shapes automation feasibility. Standard pallets, totes and cartons are easier to automate because their dimensions and pickup points are predictable, whereas damaged pallets, mixed overhangs or irregular containers increase sensing and exception-handling requirements. British Sugar's automated Wissington warehouse checks pallet dimensions and weight before storage, helping protect its automated flow. The system handles about 1,500 inbound and 1,500 outbound pallets daily, showing why load quality becomes a process-control issue.

Selection should therefore distinguish maximum load from normal operating profile. Equipment sized only for the heaviest occasional item can be unnecessarily expensive and cumbersome, while equipment based only on averages may be unsafe during peaks or exceptions. Procurement teams should analyse the proportion of loads by weight, size and handling method, then identify exceptional items separately. This often produces a mixed fleet in which standard equipment handles routine volume and specialist assets address unusual loads.

Throughput, Travel Distance and Warehouse Productivity

Warehouse productivity depends on completed movements, not nominal travel speed. Throughput calculations should include acceleration, braking, lifting, scanning, queuing, pallet engagement, battery charging and empty travel. A faster truck may deliver little benefit if it spends most of its cycle waiting at congested docks or blocked aisles. Conversely, reducing unnecessary distance can increase output without buying faster equipment. Process mapping should therefore calculate complete cycle time and movements per productive hour.

Travel distance matters most in manual picking because walking often dominates the task. Goods-to-person systems reverse the conventional process by moving inventory towards stationary or semi-stationary operators, while batch picking, zone picking and better slotting can reduce walking without any automation at all. In every case, the gains arise from system design rather than equipment speed alone, particularly by removing travel, searching and repeated handling from each pick cycle.

Automated pallet transport demonstrates the same principle at a larger scale. Sauer Polymertechnik uses eleven automated high-lift trucks on an 870-metre route designed for as many as 100 transports per hour. A simple calculation illustrates the sizing logic: if each round trip takes six minutes including handling, one vehicle completes ten trips an hour, so a peak of 60 pallet moves needs at least six vehicles before charging, maintenance or congestion are considered.

Peak throughput deserves separate modelling because warehouse demand rarely arrives evenly. Required capacity should account for hourly peaks, seasonal campaigns, late inbound vehicles, returns and equipment downtime, rather than dividing annual volume by operating hours. Simulation or time studies can expose bottlenecks before investment. Managers should also distinguish theoretical, designed and sustainable throughput: running every asset continually at maximum rate leaves no resilience for charging, maintenance, variability or recovery after disruption.

Warehouse Geometry, Aisle Width and Storage Height

Warehouse geometry can make an otherwise attractive handling system impractical. Aisle width, clear height, column spacing, door dimensions, floor flatness, rack configuration and turning circles determine which trucks can operate and how much storage capacity remains. Counterbalance forklifts generally require greater manoeuvring space than reach or very narrow aisle equipment. Consequently, equipment selection affects not only handling productivity but also how many pallet locations a given building can accommodate.

Very narrow aisle technology shows the density available when building and equipment are designed together. Linde's K combination truck can operate in aisles around 1.4 metres wide in appropriate configurations and lift to 18 metres. Its published technical data include configurations with pallet aisle widths around 1.645 metres. Such dimensions can materially increase storage density, but high-bay operations place stricter demands on floor tolerances, guidance systems, racking accuracy and operator or automation controls.

Height adds capacity only where the building, racking, sprinkler design and handling equipment can exploit it safely. Residual truck capacity usually decreases as lift height and load centre increase, so nominal ratings can be misleading. Higher storage also lengthens lift cycles and may affect throughput. A warehouse gaining hundreds of pallet positions through another rack level can therefore require stronger trucks, revised fire protection and additional capital before the extra capacity becomes usable.

Geometry also matters to automation because fixed systems consume defined space for conveyors, safety fencing, transfer points and maintenance access. AMRs require less permanent infrastructure but still need traffic lanes, charging areas and sufficient clearance around people and structures. HSE states that workplaces must organise traffic routes so pedestrians and vehicles can circulate safely. Tight layouts that maximise racking without allowing safe movement can therefore undermine both productivity and legal compliance.

Storage design should ultimately compare the value of space with the cost of handling it. Churchill China reported a 40% increase in picking space and a 10% productivity improvement after a warehouse racking project at Stoke-on-Trent. Dwell and DFS, meanwhile, use a Milton Keynes facility that can store more than 22,000 pallets. These examples show that warehouse capacity depends jointly on building geometry, racking layout, inventory policy and suitable handling equipment.

Flexibility Versus Automation

Flexibility and automation are not opposites, but they often involve trade-offs. A manually driven forklift can be redirected immediately to another task, whereas a fixed conveyor performs a narrower function with greater repeatability. AGVs offer programmed flexibility between known points, while AMRs can respond more dynamically to route conditions. Highly automated storage can deliver exceptional density and throughput, but changing its fundamental flow may require software, controls, engineering and physical modification.

The appropriate balance depends on demand certainty. Stable, high-volume movements make automation easier to justify because equipment can be highly utilised and the process remains consistent long enough to recover capital. Operations facing frequent customer changes, short contracts or volatile SKU profiles may value modular equipment more. Leasing, mobile robots or conventional trucks can preserve options, even when their labour costs exceed those of a fully automated solution operating at designed capacity.

RangePlus demonstrates the value of modularity in e-commerce. As order volumes and product variety rose, the retailer introduced a goods-to-person system that, according to Geek+, now runs continuously while allowing extra robots to be added for peaks. That incremental model suits operations where future volume is expected to grow but the exact pattern remains uncertain, because capacity can follow demand rather than anticipate it through a single upfront commitment.

Fixed automation can be preferable when flow certainty is high. British Sugar's Wissington system automatically links production and storage using conveyors, stacker cranes and shuttles, so every pallet follows a predictable path from line to dispatch. That repetitive relationship between production, storage and dispatch makes permanent infrastructure valuable. A multi-client logistics warehouse with frequent layout changes might reach a different conclusion, even if its total daily pallet volume were similar.

Contract duration should therefore feature explicitly in investment appraisal. A ten-year internal

manufacturing requirement can support specialised infrastructure that would be difficult to justify for a three-year third-party logistics contract. Residual value also matters: standard forklifts, pallet trucks and some AMRs can be sold or redeployed, whereas bespoke conveyors or crane structures may have limited value outside their original site. Flexibility has economic value even when it does not appear in purchase-price comparisons.

A hybrid approach is frequently strongest. Human-operated trucks can handle exceptions, peaks and irregular loads, while automation handles repetitive base volume. This avoids designing the automated system around every possible task, which would raise cost and complexity disproportionately. Selection should therefore ask which movements deserve automation, rather than whether to label the warehouse as manual or automated, and should revisit that question as volumes, product ranges and customer requirements change.

Capital Cost and TCO

Capital expenditure is only the opening component of equipment cost. A meaningful TCO model should include finance, installation, racking or floor changes, charging infrastructure, energy, software, licences, maintenance, statutory examination, tyres, batteries, operator training, insurance, downtime and eventual disposal. Automation also brings systems integration, testing and cybersecurity support. Comparing a purchase quotation with annual wages alone can therefore produce a misleading investment decision in either direction.

Labour remains the main recurring cost against which automation is assessed. From April 2026, the National Living Wage is £12.71 an hour for workers aged 21 and over, equivalent to approximately £26,437 a year for a 40-hour week. Employer National Insurance is charged at 15% on earnings above the £5,000 annual secondary threshold, following the April 2025 changes. Shift premiums, pensions, recruitment, absence and supervision increase the effective cost further.

Payback should be tested against realistic utilisation and downside scenarios. Toyota states that Kvik achieved efficiency gains of up to 20% from two AGVs, with payback in under one year. That is a supplier-reported result, not a universal benchmark. Procurement should model expected, conservative and stressed cases, including lower volumes, implementation delays, maintenance escalation and residual value, before approving capital, and should ask suppliers for reference sites where performance can be verified independently.

Maintenance, Reliability and Equipment Availability

Reliability converts theoretical capacity into actual warehouse output. A system designed for 1,000 movements an hour but available only 90% of the required time may perform worse than a slower system with greater resilience. Buyers should therefore examine expected availability, preventive-maintenance intervals, local engineering support, spare-parts lead times and recovery procedures. Critical operations may need redundant conveyors, spare robots, backup manual processes or additional trucks, so a single failure cannot stop dispatch.

PUWER requires work equipment to be maintained in an efficient state, in good working order and in good repair. HSE advises planned preventive maintenance and notes that maintenance frequency should reflect intensity of use, operating environment, variety of operations and the consequences of failure. For workplace vehicles, drivers should perform appropriate pre-use checks, while planned maintenance follows manufacturer guidance. Maintenance is therefore both a productivity discipline and a legal health and safety requirement.

Automation changes maintenance skills rather than removing maintenance. Conventional trucks need mechanical, hydraulic, tyre, battery and braking attention; automated systems add sensors, controls, wireless communications, software and safety devices. A fault in a barcode reader or fleet-management interface can interrupt flow even when the mechanical equipment is serviceable. Contracts should define response times, remote diagnostics, critical spares, software support and responsibilities among equipment suppliers, integrators and internal engineering teams.

Battery strategy also affects availability. Lithium-ion equipment can use opportunity charging during breaks or natural pauses, reducing battery-change activity, but charging capacity and electrical infrastructure must match the fleet. Jungheinrich's Gundlach Packaging case uses three automated pallet trucks in 24-hour, five-day operation with automatic intermediate charging. The example shows that vehicle numbers alone do not determine capacity; fleet design depends on energy replenishment, charging windows and maintenance access.

Labour Requirements and the Changing Warehouse Workforce

Mechanical handling has progressively shifted warehouse labour from carrying and driving towards supervising, picking, exception handling, maintenance and systems control. Automation can reduce repetitive travel and lifting, but it creates demand for technicians, planners and employees comfortable with digital interfaces. The workforce question is therefore not simply how many roles disappear. It is which tasks remain, what competencies are required and whether productivity gains can be achieved without dependence on scarce technical skills.

Labour costs and availability both strengthen the incentive to redesign repetitive work. Office for National Statistics data show that average total weekly pay across transport and storage was £760 during 2025, and warehouses compete for the same seasonal labour as retail, manufacturing and parcel delivery. Where recruitment is difficult, equipment that lets an existing team handle more volume can be worth more than any direct saving in wages.

Automation can also improve labour productivity without eliminating headcount. DHL reported in July 2025 that more than 750 Locus Robotics and 6 River Systems assisted-picking robots were live across 18 of its regional sites, and that more than 2,000 robots were working alongside its employees across the wider region. Collaborative models of this kind absorb growth with less recruitment, while people remain responsible for judgement, quality and exceptions.

Technology changes training requirements as well. Locus Robotics reports that DHL users of its AMRs reduced training time by up to 80% across deployments, while workers gained experience using digital picking interfaces and performance dashboards. At the same time, maintenance technicians and supervisors require deeper technical capability. Successful implementation therefore combines simpler frontline workflows with stronger engineering, data and systems skills, rather than assuming automation reduces training needs everywhere.

Employee involvement can determine whether those benefits materialise. Rhenus Retail Service reported positive acceptance of its AGV after employees were involved in the project and routine pallet transport moved away from counterbalance trucks. Workers then focused more on incoming-goods priorities and more demanding tasks. The lesson is as organisational as technical: redesigning jobs, consulting operators and explaining how responsibilities change can improve adoption while surfacing practical issues before full implementation.

Safety, Risk and Regulatory Considerations

Mechanical handling can remove hazardous manual lifting, but it replaces one risk profile with another. Forklifts introduce collision and overturning hazards; conveyors create trapping points; cranes create suspended loads; robots introduce unexpected movement and stored-energy risks. HSE recorded 126 worker fatalities in Great Britain during 2025/26, including 15 in transportation and storage. Across all industries, 24 workers were killed after being struck by moving vehicles, reinforcing the importance of workplace transport control.

The Health and Safety at Work etc. Act 1974 places an overarching duty on employers to protect employees so far as is reasonably practicable, including safe plant and systems for handling, storage and transport. PUWER then applies directly to work equipment and its protective measures. Automation does not transfer those duties to the technology supplier; the organisation operating the equipment retains responsibility for its safe use in the workplace.

Where equipment performs lifting operations, LOLER may also apply. HSE requires lifting equipment to be fit for purpose, appropriately marked and, where applicable, thoroughly examined by a competent person. Lifting operations must be properly planned, supervised and carried out safely. Thorough examination differs from routine servicing, so a maintenance contract does not automatically satisfy statutory examination requirements or replace the dutyholder's wider responsibilities for safe use.

Traffic design remains essential even with driverless vehicles. The Workplace (Health, Safety and Welfare) Regulations 1992 require traffic routes to allow pedestrians and vehicles to circulate safely. HSE specifically advises that automatic vehicles sharing routes with pedestrians should have safeguards to reduce injury risk and enough clearance to prevent trapping. Physical segregation, crossings, controlled doors, speed management and visibility can therefore remain necessary despite sophisticated scanners and obstacle-detection technology.

New machinery supplied in Great Britain must also satisfy product-safety law. The Supply of Machinery (Safety) Regulations 2008 require machinery to meet essential health and safety requirements, conformity assessment, documentation, instruction and marking obligations before it is placed on the market. Statutory Instrument (SI) 2026/867, made in July 2026, will from 20 January 2027 also recognise machinery meeting the new European Union (EU) Machinery Regulation. Buyers should verify compliance evidence, not marking alone.

The strongest safety strategy combines engineering, layout and management. Risk assessment should consider normal operation, maintenance, cleaning, jams, battery charging, software failure, fire, pedestrian interaction and foreseeable misuse. HSE stresses that maintenance itself creates serious hazards and should be planned, isolated and carried out by competent people. Selecting safer equipment is therefore only the beginning; safe performance depends on commissioning, training, inspection, preventive maintenance, traffic control and disciplined operating procedures throughout the equipment's life.

Energy, Batteries and Charging Infrastructure

Energy strategy now shapes equipment selection because electric trucks, automated vehicles and robots depend on reliable charging as much as mechanical performance. Lead-acid batteries remain suitable for many single-shift or lower-intensity operations, while lithium-ion technology offers faster charging, opportunity charging and lower routine maintenance. The correct choice depends on utilisation, shift pattern, available electrical capacity, charging windows, ambient temperature and the consequences of losing equipment availability during peak activity.

Toyota states that its 25-volt lithium-ion batteries can charge fully in about 80 minutes, restore 50% of capacity in around 30 minutes and deliver up to 30% greater energy efficiency than lead-acid technology. The manufacturer also says lithium-ion batteries can last more than three times as long as lead-acid equivalents. These figures show why a higher purchase price can be offset in intensive, multi-shift operations where equipment rarely stands idle.

Charging infrastructure must be sized around fleet behaviour, not charger count alone. Toyota warns that rapid lithium-ion opportunity charging can draw substantially more instantaneous power than slow lead-acid charging, making site capacity and peak demand important. Vaillant Industrial eliminated battery changing after introducing Jungheinrich lithium-ion trucks, while Marquardt removed battery-change stations entirely. Both examples show that energy decisions affect floor space, uptime, maintenance and electrical infrastructure at the same time.

Integration with Warehouse Management and Control Systems

Automation delivers limited value when material movement is disconnected from inventory and order information. A Warehouse Management System (WMS) typically governs stock location, replenishment, picking and order status, while a Warehouse Control System (WCS)

coordinates conveyors, robots, cranes and other automated equipment in real time. Effective integration lets instructions, confirmations, exceptions and inventory movements flow between business software and physical equipment without repeated manual data entry or conflicting priorities.

Integration increasingly relies on standard software interfaces rather than bespoke point-to-point connections. AutoStore says its controller can communicate with existing warehouse systems through standard application programming interfaces, securely covering picking, goods-in and workstation activity. Toyota's T-ONE software similarly acts as a communication layer between automated trucks, WMS platforms and production systems, coordinating goods locations, orders, vehicle traffic and material flow. Standard interfaces also reduce dependence on a single integrator when systems change.

Arvato provides a practical illustration. Swisslog's SynQ software integrates with Arvato's Systems, Applications and Products in Data Processing (SAP) environment to control inventory by batch, quantity and designated workstream while managing AutoStore retrieval. The same software layer must absorb every expansion of the hardware, so integration capacity should be specified with growth in mind rather than sized only for the initial installation and its opening volumes.

DHL Supply Chain demonstrates integration at pallet scale. Its 15 autonomous forklifts at Tyrefort in the West Midlands connect to the Blue Yonder WMS and handle picking, put-away and replenishment at heights up to 11.5 metres. DHL calculated that 12 such forklifts working continuously could handle more than one million pallets annually. The example shows why software integration is not an information-technology afterthought but part of the equipment's productive capacity.

When Automation Makes Financial Sense

Automation makes the strongest financial sense where work is repetitive, measurable and frequent enough to keep expensive assets productive. High labour content, long travel distances, limited floor space, predictable flows and multi-shift operation can strengthen the case. The calculation should focus on avoided costs and additional capacity rather than on technology itself. An automated system that eliminates a bottleneck or postpones a building extension may create more value than one justified solely through headcount reduction.

THG's Manchester fulfilment centre provides a notable UK example. According to AutoStore, THG achieved a 40% reduction in variable labour costs compared with the preceding manual operation, together with a 180-basis-point reduction in distribution costs over two years. Those distribution savings were sufficient to fund the investment, giving payback in about two years. The result reflects very high, sustained volumes and should not be read as a typical outcome for smaller operations.

Automation can also become viable when equipment operates for periods that manual labour cannot economically sustain. Toyota states that automated warehouse-truck projects commonly target returns within around two years, while its Udon case reports typical automated-solution payback of two to three years. These are supplier-reported benchmarks rather than guarantees, but they provide useful reference points when tested against local labour rates, utilisation, maintenance, integration and financing costs.

Public-sector investment should be tested against service resilience and taxpayer value, not just labour savings. Midland Metropolitan University Hospital in Smethwick, opened by Sandwell and West Birmingham Hospitals NHS Trust in October 2024, uses 12 AGVs to carry pharmaceuticals, linen, waste, mail and theatre equipment from its warehouse to ward hubs. Supplier Aerocom estimates that each NHS AGV could release 19,500 staff hours over five years, with return on investment within four years.

Automation is less convincing where volumes are uncertain, products change rapidly or utilisation would remain low. Financial models should therefore calculate payback, Net Present

Value (NPV), cash requirement and sensitivity to lower throughput, higher maintenance or delayed commissioning. They should also quantify often-missed benefits, including reduced damage, improved accuracy, additional storage density, avoided overtime and deferred property expenditure. A credible case survives conservative assumptions rather than depending on perfect operating conditions.

When Conventional MHE Is the Better Choice

Conventional handling equipment remains the better choice where work is variable, volumes are modest and operators regularly encounter exceptions. A counterbalance forklift, pallet truck or stacker can be redirected within minutes, while fixed automation may require programming, engineering or physical modification. Small warehouses, short-term contracts, irregular inbound loads and operations with frequent layout changes can therefore benefit more from flexible equipment than from capital-intensive technology, even when automation appears more sophisticated.

Low utilisation strongly favours conventional equipment. A manually operated truck can be parked when demand falls, hired seasonally or shared across several tasks. In contrast, an automated system still incurs depreciation, software, maintenance and support costs regardless of volume. Toyota has acknowledged that a lightly used fleet operating conventional daytime hours may be better served by lead-acid trucks than higher-cost lithium-ion alternatives, illustrating the broader principle that intensity should justify technological complexity.

Rental can further reduce commitment. Impact Handling markets light-use electric forklift rental from £79 per week, offering an alternative to ownership for intermittent or uncertain workloads. Short-term rental can also cover Christmas peaks, projects, breakdowns or temporary buildings without creating stranded capital afterwards. The comparison should include rental charges, transport, excess hours and damage provisions, but flexibility can be highly valuable when future demand or contract duration is hard to forecast.

Conventional equipment can also outperform automation where load quality is inconsistent. Damaged pallets, irregular stillages, long products and one-off items often require visual judgement, improvisation or specialist attachments that a human operator can apply quickly. Automation can handle variation, but sensing, grippers, software and exception routes add cost. When only a small percentage of movements are unusual, keeping human-operated equipment for those tasks may be more economical than engineering automation around every exception.

Building constraints may produce the same conclusion. Older warehouses can have uneven floors, low beams, mixed doorway widths, congested yards or infrastructure unsuited to autonomous navigation and fixed conveyor routes. Retrofitting those conditions can cost more than the equipment itself. A conventional reach truck or counterbalance truck may therefore provide a practical bridge until lease renewal, relocation or major refurbishment creates an opportunity to redesign flows and infrastructure around automation.

A hybrid model often delivers the best results. Primafruit uses automated counterbalance trucks for routine internal fruit movements while retaining manually operated vehicles for vehicle loading and less predictable work. Arrangements of this kind let automation absorb stable base volume without sacrificing human flexibility, and they allow the automated share to grow as confidence builds. The objective should be to automate appropriate movements, not to remove conventional equipment merely because newer technology is available.

Comparing MHE

An equipment comparison should begin with the movement profile rather than a hierarchy of technologies. Hand pallet trucks offer very low capital cost and high flexibility for short moves; powered pallet trucks reduce effort over greater distance; forklifts provide broad pallet-handling capability; reach and very narrow aisle trucks increase storage density; conveyors

excel at repetitive fixed flows; cranes handle exceptional loads; and automated systems trade greater capital commitment for consistency, density and lower direct labour.

Table 1: Indicative comparison of mechanical handling options (prices are examples cited in the text, not market rates)

Equipment	Typical load	Throughput	Space need	Flexibility	Indicative capital cost	Labour reliance	Maintenance
Hand pallet truck	Single pallets, floor level	Low	Narrow aisles	Very high	From c. £189 + VAT	High	Low
Powered pallet truck	Single pallets, longer runs	Low to medium	Narrow to moderate	High	From c. £1,277	High	Low to moderate
Stacker	Pallets to low or medium height	Low to medium	Moderate	High	c. £2,380 to £3,295	High	Moderate
Counterbalance forklift	Pallets, yard and dock work	Medium	Wide aisles	Very high	Used c. £11,000 to £13,000; new 2-tonne electric £36,975	High	Moderate
Reach truck	Pallets at height in racking	Medium	Narrower aisles	Medium	Used c. £15,800 to £22,380	High	Moderate
Conveyor	Cartons, totes, pallets on fixed routes	High	Fixed footprint	Low	Project-priced	Low per movement	Moderate to high
Crane or hoist	Heavy, awkward or long loads	Low to medium	Overhead; clear floor	Low (zone-bound)	Hoists c. £1,460 to £3,690; full cranes project-priced	Medium	Moderate, plus LOLER examination
AS/RS	Totes, bins or pallets in dense storage	Very high	Dense; dedicated structure	Low to medium (modular grids scale)	Project-priced	Low	High
AGV	Pallets on repeat routes	Medium to high	Defined routes	Medium	Autonomous pallet truck from £13,000 + VAT	Low	High (software and sensors)
AMR	Shelves, totes, cartons	High in picking	Shared floor; traffic lanes	High	Fleet and project-priced	Medium (people pick)	High (software and network)
Robotic palletiser or arm	Cases, layers, parcels	High, consistent	Guarded cell	Low to medium	Project-priced	Low	High

The table above summarises indicative characteristics drawn from the listings and examples cited throughout. Prices show the scale of difference rather than a market rate: a new two-tonne Toyota electric counterbalance truck was listed at £36,975, roughly 195 times the cost of a basic hand pallet truck, while automated storage, conveyor networks and robotic systems are usually project-priced because software, controls, integration and commissioning can equal or exceed the core machinery cost.

No single metric identifies the best option. Capacity, lift height, aisle width, travel distance, throughput, labour, maintenance, safety, energy, flexibility and residual value should be considered together. A £15,000 truck that supports changing layouts may outperform a much larger automated investment in a volatile operation, whereas an expensive goods-to-person system can outperform conventional picking where volumes are sustained. Selection is therefore an optimisation exercise rather than a technology ranking.

How to Select the Right MHE

Selection should start with measured operational data. The organisation should quantify load weights and dimensions, pallet and container types, hourly movements, travel distances, lift heights, storage locations, peak volumes, operating hours and exception frequency. Building drawings should then confirm aisle widths, floor capacity, clear height, doors, columns and charging locations. Using actual distributions rather than averages helps prevent oversizing equipment for rare loads or undersizing it for predictable peaks.

The next stage is to translate demand into functional requirements without prematurely specifying a product. Requirements might include moving 60 pallets an hour across 120 metres, placing 1,000-kilogram loads at ten metres or processing 500 order lines each hour. Suppliers can then propose different technical solutions against the same outcome. This approach encourages competition between technologies and reduces the risk of buying a familiar machine that was specified before the problem was understood.

Trials and simulation should be used where practical. Demonstrations can reveal visibility, turning, ergonomics, charging and load-handling issues that brochures cannot show, while simulation can test congestion and peak throughput before physical investment. References from comparable operations are particularly valuable because nominal performance rarely equals sustainable performance. Acceptance criteria should define throughput, accuracy, availability, and safety expectations so commissioning can measure whether the selected system delivers the promised capability.

The final decision should balance operational fit with lifecycle economics and supplier capability. Service coverage, spare parts, training, software support, cybersecurity, upgrade paths and residual value matter alongside specification. Public bodies in England, Wales and Northern Ireland must also comply with the Procurement Act 2023, in force since 24 February 2025, while Scotland applies its own regime. Private organisations should apply equivalent commercial discipline and choose solutions that remain supportable throughout their intended operating life.

Common Equipment Selection Mistakes

One common mistake is buying for maximum capacity without understanding normal demand. Selecting a larger forklift because it can handle the heaviest occasional load may increase purchase price, energy use, aisle requirements and tyre costs throughout its life. The reverse error is equally damaging: specifying equipment around average loads can create unsafe or inefficient exceptions. Segmentation usually produces better decisions, with standard equipment covering routine volume and specialist arrangements handling genuine outliers.

A second mistake is treating purchase price as total cost. Cheap equipment can become expensive when maintenance response is poor, batteries need frequent replacement, spare parts are unavailable or downtime interrupts dispatch. Automation magnifies the issue because failures can affect connected processes, not just one vehicle. Procurement should compare capital, finance, energy, maintenance, labour, software, consumables, statutory inspection and residual value over the same evaluation period before concluding which option is cheaper.

Ignoring warehouse geometry is another frequent error. Equipment can satisfy capacity and lift requirements while failing to turn safely within existing aisles, fit beneath doorways or operate on the available floor. High-bay trucks may also lose residual lifting capacity at height. Site surveys should therefore verify physical dimensions and floor conditions before the contract is awarded, because changing racking, doors or structural features after delivery can erase savings from competitive equipment pricing.

Technology enthusiasm creates a fourth risk: automating a poor process. Installing robots or conveyors around unnecessary travel, weak replenishment rules or inaccurate master data can preserve inefficiency at a higher capital cost. Successful automation depends on

integration with warehouse software and disciplined information flows, as the Arvato and DHL examples show. Process simplification, slotting, inventory accuracy and exception design should therefore precede automation rather than be postponed until after equipment is commissioned.

Finally, organisations can underestimate implementation and change management. New equipment affects routes, maintenance, training, supervision, emergency procedures and employee roles. Commissioning a technically successful system without sufficient operator involvement can create workarounds or poor adoption. Time should be allowed for testing, training, data cleansing, ramp-up and contingency planning. A phased deployment can reduce risk by proving performance at a manageable scale before additional vehicles, robots or automated zones are purchased.

Building a Business Case for Mechanical Handling Investment

A strong business case begins with a documented baseline. Current labour hours, equipment numbers, maintenance expenditure, energy use, damage, overtime, rental, storage utilisation, throughput and service failures should be measured before benefits are estimated. Without that baseline, projected savings cannot be validated after implementation. Benefits should then be linked to specific changes, such as fewer travel hours, greater pallet density, reduced damage or additional orders processed without equivalent workforce growth.

Capital expenditure should include every cost required to make the solution operational. Trucks may require chargers, batteries, attachments and training; automated systems may require conveyors, racking, guarding, software, network improvements, electrical upgrades, systems integration and commissioning. Contingency should be explicit rather than hidden. Comparing an automation quotation that includes installation with a conventional-equipment quotation covering only vehicles creates a distorted result, just as excluding building modifications understates the true investment.

The financial model should convert benefits into annual cash flows and test multiple scenarios. Payback shows how quickly the investment is recovered, while NPV accounts for the timing of future cash flows. Sensitivity analysis should reduce forecast volume, increase labour or maintenance assumptions and delay go-live dates. If the investment works only under the most optimistic case, decision-makers should question whether the operational benefits justify the financial exposure being taken on.

UK tax treatment can materially affect private-sector cash flow. The Annual Investment Allowance (AIA) remains £1 million a year for qualifying plant and machinery, and companies may claim 100% full expensing on qualifying new and unused main-rate assets. A new 40% first-year allowance, available from 1 January 2026, extends relief to new main-rate assets bought for leasing. From April 2026, the main-rate writing-down allowance fell from 18% to 14%.

Benefits that do not immediately appear in payroll should also be valued. Additional storage density can postpone warehouse expansion; higher accuracy can reduce returns; reliable throughput can protect customer service; safer handling can reduce disruption; and automation can provide capacity where recruitment is difficult. For a public body, avoided agency staff, fewer missed deliveries to wards or schools and better stock visibility can carry similar weight, even when they never appear as cashable savings.

Governance should continue after approval. The business case should become the benchmark against which implementation and operating performance are measured, with named owners for benefits, costs and risks. Post-investment reviews can compare actual throughput, labour, maintenance and availability with forecasts and inform subsequent purchases. This is particularly important for modular automation, where successful first phases may justify expansion, while disappointing results should be understood before further capital is committed.

The Future of MHE

The future of mechanical handling is likely to be hybrid rather than fully autonomous. Toyota's 2026 logistics trend material identifies automation, digitalisation and energy management as converging priorities, with people, conventional equipment and robotic systems increasingly working together. AI, machine vision and more capable sensors are extending automation into picking, unloading and dynamic navigation, while modular systems let organisations automate individual processes without redesigning an entire warehouse at once.

Connectivity will become as important as mechanical capability. DHL's Robotics Hub already promotes plug-and-play connectivity between robotics and WMS platforms, and its 2026 adoption of a robotics-integration platform aims to connect different technologies through reusable interfaces and monitor them across multiple sites. This modular direction reduces dependence on single, monolithic automation architectures and should make future equipment easier to introduce, reconfigure or replace as operational requirements change.

Energy constraints will shape development as strongly as robotics. Electrification increases dependence on charging capacity, smart energy management and resilient power supplies, while Toyota identifies on-site generation, battery storage and intelligent charging as emerging warehouse considerations. Humanoid robots and remote operation are also being explored, but remain less mature than forklifts, AGVs and AMRs. The likely future is therefore a gradual layering of proven technologies rather than wholesale replacement of existing equipment.

Summary – Selecting Equipment Around the Operation

MHE should be selected around the operation rather than forcing the operation around a preferred machine. Load characteristics, throughput, travel distance, lift height, warehouse geometry and peak demand set the technical requirements; labour, energy, maintenance, safety and flexibility define the commercial context. From a £189 hand pallet truck to a multimillion-pound automated installation, value depends on how precisely the solution matches the work it is expected to perform.

Conventional equipment remains essential because flexibility has economic value. Pallet trucks, forklifts, reach trucks, order pickers and specialist vehicles can be redeployed quickly, hired for peaks and adapted to changing layouts. Conveyors, cranes, AS/RS, AGVs, AMRs and robotic handling become stronger where flows are repetitive, utilisation is high and service requirements justify investment. Most large operations, public and private alike, will continue to combine several technologies rather than choose one exclusively.

Investment decisions should therefore focus on total lifecycle value. Capital cost is only one element alongside labour, charging infrastructure, energy, maintenance, software, statutory examinations, training, integration, downtime and residual value. Financial analysis should test realistic throughput and conservative assumptions while recognising benefits such as extra storage capacity, reduced damage and improved resilience. Tax allowances can improve cash flow, but they should support a sound operational case rather than create one.

The strongest selection process is evidence-led: measure the requirement, simplify the process, compare technologies, test assumptions, evaluate suppliers and verify performance after implementation. Automation belongs where it solves a defined operational or financial problem, and conventional equipment where its flexibility provides greater value. Mechanical handling is ultimately not a contest between people and machines, or between old and new technology; it is the disciplined design of safe, efficient material flow.

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