



WHAT IS THE **FORKLIFT** OF THE FUTURE?

Evolution or Revolution?

A whitepaper brought to you by:





The Forklift - an Industry Icon Looking to the Future

In this special focus on forklifts, we explore the history and evolution of these hard-working machines – and investigate what role traditional forklifts can play in tomorrow's industrial world.

With companies in every industrial and commercial sector focused on delivering efficiency gains across their supply chains, today's forklift trucks – for so long the workhorses of any well executed logistics operation – are expected to perform harder for longer and with the absolute minimum of downtime.

Sophisticated products featuring complex electronic and hydraulic systems and an attention to ergonomic design that ensures high productivity and operator comfort, today's lift trucks are almost unrecognisable from the somewhat agricultural machines that were first produced in significant numbers in the 1940s to help speed the loading and unloading of military supplies during World War 2.

And while the forklift's core function remains essentially the same today as it was back in the first half of the last century – namely, to pick up palletised loads and transport them safely and efficiently between two given points before setting them down

again – **the modern purchasing manager has a lot to consider before deciding which forklift make and model best suits his or her company's needs.** What power source is most appropriate? Will forklift operators be comfortable throughout their shift or even would a form of automated driverless forklifts be a better choice?

At a recent UK Materials Handling Thought Leadership Event there was an insightful presentation from Futurologist Tracey Follows. Tracey discussed near, long, mega, and micro trends and how the use of AI, the metaverse and Avatars will impact the way we live, work, and spend our leisure time and ultimately how businesses will be impacted by the changes that are on the horizon. Providers of materials handling solutions are already harnessing digital advancements and are benefiting from robotic and AI driven solutions. Digital twinning is the go-to technology when it comes to product design and optimising workflows.

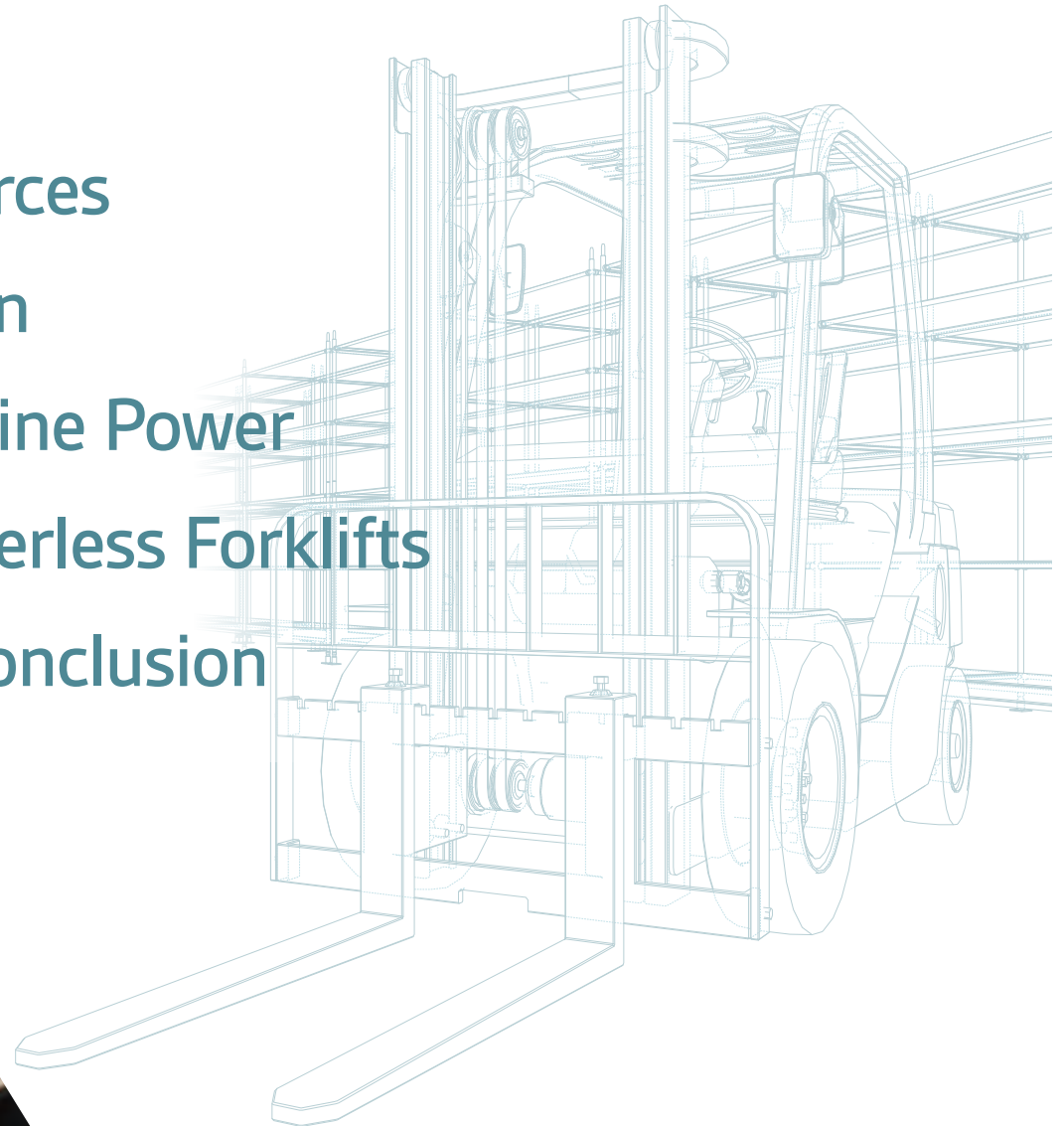
This whitepaper explores some of the technical advances that are currently shaping lift truck design and considers future developments that are likely to impact the forklift trucks of the future.





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Power Sources



1 Power Sources

Like the automotive sector, the global forklift industry has been channelling a sizable chunk of its R&D budget towards the development of productive, energy efficient and environmentally friendly fuel sources.

Traditionally, along with the lead acid battery, diesel and LP Gas have been the most popular power sources for forklift trucks, but with environmental concerns driving customer demand for more energy efficiency, coupled with a growing awareness of the health risks associated with the emissions produced by some fossil fuels, recent years have seen a significant move away from diesel and greater use of electric trucks – even within the type of harsh environments that only IC-engine trucks would previously have been considered suitable for.

According to most reliable estimates, the forklift market has historically been split 60-40 between LPG- or diesel-powered internal combustion engine (IC) trucks and battery-driven electric models – with diesel being the most dominant fuel. But, as more and more truck users opt for electric-power over IC-engine driven machines, **the UK market for electric counterbalanced forklift trucks is expected to grow by as much as 10 per cent in the next five years.**

While heightened environmental anxiety, greater awareness of staff welfare and rising fuel prices are all significant factors in the clear shift away from diesel and LPG towards electric forklifts, advances in battery technology, such as the further development of lithium-ion and, to a lesser extent (for now, at least) hydrogen fuel cells, are also leading to greater interest in electric power. The significant changes to intralogistics processes brought about by the seemingly relentless increase in internet shopping tend to favour electric trucks and are an important influence too.

“In response to the challenge of meeting net zero carbon emissions all-electric fleets will continue to become more common,” says **Martin McVicar, managing director of Combilift.**

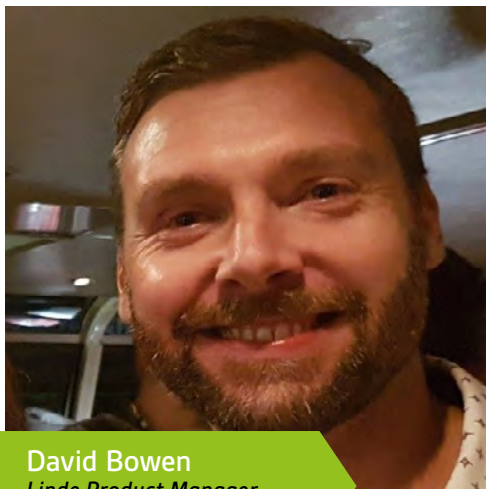
Combilift has substantially expanded its electric range in the last few years and almost every model in the company's portfolio is now available as an electric variant.

“Truck users will continue to want to partner with suppliers who can prove their commitment to sustainability and we have focused recently on designing forklifts with as small a footprint as possible for the tasks they need to carry out to achieve optimum storage density,” adds Martin McVicar.



Martin McVicar
Managing Director
Combilift

COMBiLiFT
LIFTING INNOVATION



David Bowen
Linde Product Manager
Linde



But it would be wrong to conclude that the electric truck market is only growing because diesel and LP-Gas sales are in decline: recent developments in technology mean the electric lift truck is now a highly advanced piece of kit that offers real business benefits to the broadest range of users.

In fact, perhaps the single biggest technological advance behind the upsurge in electric truck sales is **the arrival of the Lithium-Ion battery (LiB)**. While lead acid remains the dominant battery type within the electric-powered forklift market (it is estimated that in the region of 90 per cent of all electric forklifts in operation throughout the world are still running on lead acid batteries), the Lithium-Ion solution has now become well established as a viable alternative and sales of Lithium-Ion forklifts have been on a sustained upward curve for some time.

For example, nearly a quarter of all Toyota electric-powered forklift trucks ordered for delivery in the UK now feature LiB technology.

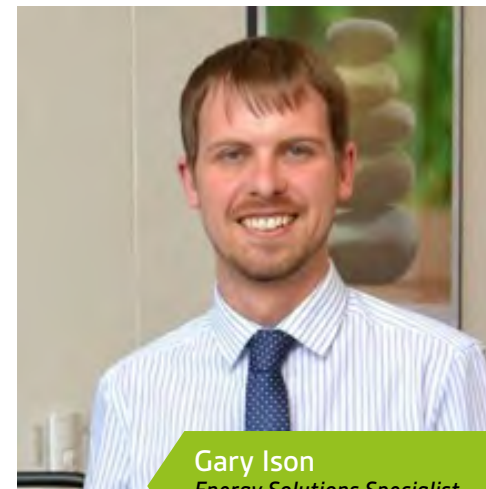
And while Linde Material Handling report seeing a substantial migration towards Lithium-Ion batteries over the last five or six years, **Linde Product Manager, David Bowen**, says this has "not led to changes in relative sales volumes" of models within the company's electric truck portfolio.

David Bowen says: "The trend away from internal combustion has been accelerated by the particular benefits which make Lithium-Ion powered trucks more cost-effective and easier to work with than traditional lead acid battery-powered units."

Gary Ison, Toyota Material Handling UK's Energy Solutions specialist, says that in the right applications, Lithium-ion is revolutionising the way that companies operate their intralogistics processes.

He comments: "Lithium-ion batteries have the ability to be recharged from 20 to 100 per cent in as little as one hour - which increases a truck's overall availability. One hour's charging will give in the region of 4 to 5 hours of operating time. Also, as these batteries allow for opportunity charging, trucks can be recharged anywhere by the operator during breaks in a shift or other periods of downtime. As a result, there is no need to swap batteries and, with zero maintenance nor emissions during charging, spare batteries and a dedicated charging room are not necessary."

Obviously, a cultural shift is required to ensure that operators get into the habit of opportunity charging during their breaks. "But," says **Phil Woodhall, Head of Product Management at Jungheinrich UK**, "once this is embedded within day-to-day thinking, the overall employee experience should be enhanced - especially if, in the future, they can use wireless charging locations."



Gary Ison
Energy Solutions Specialist
Toyota Material Handling UK



He continues: "Add in automated alerts and the intelligence inherent with increasing digitalisation of forklift truck technology, and both operators and supervisors will have an instant understanding of battery performance and charge level."

Phil Woodhall adds: "This technology also opens the door to a raft of other changes - from relocating and shrinking charging areas to freeing up warehouse space and avoiding the problems of poorly parked trucks on charge to locating charging stations adjacent to employee break rooms or canteens. Essentially the new charging model not only provides a chance to minimise downtime but also introduce more employee welfare-friendly policies that will be increasingly key in a labour starved market."

Of course, as with most things, cost will be a key factor in deciding the speed and the extent of the up-take of Lithium-Ion battery-powered forklifts. At the moment Lithium-Ion trucks are more expensive to acquire than conventional lead-acid battery driven machines and the need to reconcile environmental concerns within the constraints of an economically challenging market is an unenviable task with which many purchasing managers must grapple.

And while anecdotal evidence points to Lithium-Ion's higher initial acquisition costs being the technology's biggest downside in the eyes of some buyers, with increasingly

sophisticated forklift users prepared to base their purchase decision on the cost of running a forklift over its lifetime, Lithium-Ion's reduced running costs mean they are financially attractive to those prepared to take a medium or long-term Cap-Ex view.

LiB technology is now available – as an option – on almost all electric counterbalance and warehouse truck ranges offered by Mitsubishi Forklift Trucks.

"Traditional lead-acid batteries remain a popular choice for many companies, probably due to their lower purchase costs compared to LiB. However, the advantages of LiB can't be ignored. For example, Lithium-Ion is much more energy efficient and who doesn't like a lower energy bill?" says **Lloyd Davies, UK Product Manager, Logisnext UK Ltd – part of the Mitsubishi Logisnext Group.**

According to **Donald Houston, managing director of articulated VNA truck specialist, Narrow Aisle**, LiB technology is most beneficial at sites where trucks need to be immediately available for work over extended multiple shifts.

"Essentially, a company that needs one reach truck available 24 hours-a-day has plenty to gain from switching to LiB while it is likely to make more financial sense to stick with lead acid if your facility operates a dozen machines for an intensive day shift," he says.

Phil Woodall
Head of Product Management
Jungheinrich UK



Lloyd Davies
UK Product Manager
Logisnext UK Ltd.





Donald Houston
Managing Director
Narrow Aisle



He adds: "In fact, with Lithium-Ion offering so many benefits that are revolutionising the way some companies operate their intralogistics processes, it is easy to forget that, for many users, the traditional lead acid battery – which has been a highly capable forklift power solution for many years - still represents the best option."

According to **Clare Bottle, CEO of the United Kingdom Warehousing Association (UKWA)** – the trade body for the third-party logistics sector, "companies considering switching from IC- to electric-engine forklift trucks, should always discuss their options with their MHE supplier who will be able to assess the benefits of going electric for every type of operation."

Clare Bottle continues: "Any forklift user that is considering switching to Lithium-Ion, must be sure that their MHE supplier really understands their business and undertakes a thorough survey of the handling operation as well as, most importantly, the infrastructure of the site."

"At any multi-shift operation with a high number of trucks working it is essential to manage and schedule operator break periods and consider the scenario where several LiB trucks are 'plugged in' for recharging at the same time."

"This is because during the shorter 'opportunity' recharging process a LiB can draw down up to four times the power from the National Grid than that which is needed to charge a traditional lead-acid battery over 8 – 12 hours. If charging schedules are not

properly managed and too many LiBs are on charge at the same time, there is risk that a building's power supply could be overloaded."

"UKWA's advice to members considering switching to Lithium-Ion is to speak to their utilities provider to flag up any potential power supply issues from the outset. But good charging discipline will deliver the consistent power levels required to allow the trucks to work around the clock – even within the most demanding environments."

"The leading truck manufacturers will consider all aspects of a client's operation from the outset and model the optimum choice of battery and battery charging regime for any facility."

Clare Bottle adds: "Today's battery-driven warehouse forklift fleets can run entirely carbon neutral if powered by electricity from green and sustainable sources, such as Solar PV. an area that so far has been largely untapped."

"UKWA's recent report into solar planning on warehouse rooftops highlighted the barriers to sustainable energy presented by grid permits and recommend that the approach to DNO/DSO and connection planning should be reformed. Accordingly, UKWA is pushing the government to tackle the critical underinvestment in grid infrastructure to enable the widespread installation of commercial rooftop solar. Our message is that these barriers to investment should be addressed if the UK is to avoid further energy crises in the future."

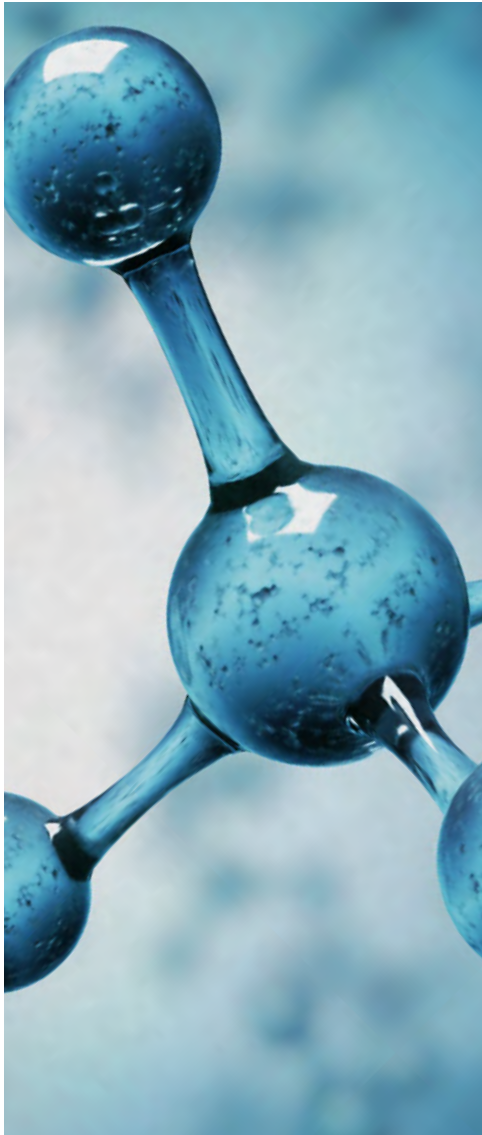


Clare Bottle
CEO
United Kingdom Warehousing Association





Hydrogen



2 Hydrogen

Hydrogen fuel cells are also emerging as another viable alternative to lead acid batteries. Essentially, a **hydrogen fuel cell is an energy conversion device that converts its fuel (hydrogen) into electrical energy to provide an electric motor with electricity.**

Research on hydrogen fuel cells has been ongoing for several years – decades, in fact – and it is seen by many as the fuel of the future: it is odourless, non-toxic and safe to breathe, it packs a lot of energy per pound and, when used to power a fuel cell, the only product left over is water.

Currently hydrogen only becomes financially realistic at sites where in the region of 90+ lift trucks are in operation due to the investment required in hydrogen generation and storage systems, so the potential user market is currently somewhat limited.

However, large fleet operators are keen to embrace the technology. Toyota Hydrogen fuel cell-powered forklifts, for example, are operating at sites across the Nordic region and Europe as well as Australia.

"As with any new development when the infrastructure and operating solution matures the price will drop. There is every reason to believe hydrogen fuel cell power will be within reach of many businesses with

a forklift fleet in the not-too-distant future," says Toyota's Gary Ison.

But, realistically, most forklift users will have to wait until hydrogen supplies for HGVs, buses and other commercial vehicles become established and provide local access to the fuel before hydrogen becomes a viable option. Most estimates put this at between 5 and 7 years away.

"Hydrogen fuel cells won't be the answer to every situation but for large fleets with intensive use patterns and / or high availability requirements hydrogen makes a lot of sense," says **Adam Keenan, Business Development Manager at Intelligent Energy.**

Adam continues: "We're already seeing a lot of interest from fleet operators in Europe and the US that were early adopters of Lithium technology and are starting to look for the 'what's next?' to improve their operational efficiencies.

"The perception of hydrogen fuel cells is that they are a still a future technology, but that couldn't be further from the truth – Intelligent Energy have been manufacturing on a commercial scale for over 20 years. As fuel cells become more commonplace generally, I expect we'll see uptake accelerate rapidly within warehousing as operators



Adam Keenan
Business Development Manager
Intelligent Energy





David Goss
Technical Director
UKMHA



become more comfortable with the technology and continue to pull away from combustion engine MHE."

"Hydrogen fuel cell technology is technically viable and available now in the marketplace," says **David Goss, technical director of UKMHA**, the trade body that represents manufacturers, suppliers and dealers of materials handling equipment in the UK.

He continues: "In most industrial truck applications, a fuel cell would be paired with a small battery to cover peak requirements, energy regeneration from braking, etc. Accordingly, the performance will be identical to that of a battery/electric truck.

"We don't have to wait five or ten years for this – fuel cell manufacturers have developed designs that are readily interchangeable with common batteries so, in many instances, for existing electric powered designs, major product redesign isn't required to enable adoption."

Advocates of hydrogen point to the sustainability and safety advantages that hydrogen can bring. Intelligent Energy's Adam Keenan says: "The biggest sustainability gains can be made by sites that already have on-site renewables or are planning to invest in them. Where excess solar power is usually sold back to the DNO having an on-site electrolyser to generate hydrogen, this excess power can be captured and stored at scale, enabling fleet

operators to vastly reduce their reliance on grid power for night shifts and through the winter months."

Some people see hydrogen as unstable and prone to exploding. Adam Keenan contends that this is a misconception. "In truth it's no more dangerous than any other fuel providing sensible precautions are taken when handling and storing it," he says. "And at a basic operational level risks associated with battery handling, cleaning, and re-watering are eliminated, off-gassing from charging is removed and ATEX zones can be largely moved away from operational areas."

UKMHA's David Goss adds: "Hydrogen needs to be clean, both in the environmental sense,

but also sufficiently pure to be suitable for use in a fuel cell. UK Government policy talks a lot about the hydrogen economy, but it doesn't look to have a solution for either of these issues in the near term because Government focus is currently on gas burning applications, such as domestic heating and industrial furnaces. The approach elsewhere in Europe is very different, and there is a risk that the UK will fall behind in fuel cell adoption. However, with suitable incentives, for example around planning consents, generation of hydrogen at the point of use, such as through renewables production at warehouse and distribution centres, could see adoption rapidly accelerate."



IC Engine Power



3 IC Engine Power

With the worldwide rush to minimise the use of fossil fuels and the myriad benefits that electric trucks offer when it comes to running costs, productivity, reduced pollution etc, it is hard to see anything but the continued decline of IC engine trucks sales. Some manufacturers have even opted to stop supplying new diesel and LPG-powered trucks.

Jungheinrich, for example, ended deliveries of new diesel and LPG trucks to the UK market in 2021 and in Spring of 2023 its last ever diesel truck left the production line.

Jungheinrich's Phil Woodhall, comments: "Our customers responded very positively to our announcement that we were ending IC engine truck deliveries to the UK market. Our customers are looking for us to back up our sustainability commitments with action that enables them to support their own strategies for sustainable procurement. By changing our strategy and ceasing to supply IC engine trucks we are supporting our customers' environmental commitments."

With Euro 7 emissions guidelines due to come into effect in 2025 and diesel and gas prices sustaining their upward trajectory, further change in the marketplace is inevitable. But, while we may well be witnessing the beginning of the end for the IC-engine-powered lift truck, there are

still numerous applications, particularly where extra-heavy lifting is involved and truck capacities of 8 tonnes and over are required, where an IC-engine remains the best forklift option - although with electric-powered 'heavy' truck technology developing rapidly, this might not still be the case in 10 years' time, as David Goss of UKMHA points out: "Battery/electric trucks are becoming increasingly capable of competing in traditional ICE work environments. For example, the 2022 UKMHA Archie Award winner, the Mitsubishi EDiA XL, is specifically designed to compete in this segment, and many other manufacturers have taken a similar approach. 10 years ago the Counterbalance market was roughly split evenly three ways between battery/electric, diesel and LPG but today, battery/electric trucks account for around 50 percent of the counterbalance market."

A possible cause for some optimism about the long-term prospects of IC-engine power is the ongoing development and refinement of a number of low carbon, low emission, fossil-free and sustainable alternatives to conventional fossil diesel.

For example, HVO – or, to give it its full name, Hydrotreated vegetable oil - is said to allow IC-engine-powered forklift truck users to cut their net CO2 emissions by as much

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By changing our strategy and ceasing to supply IC engine trucks we are supporting our customers' environmental commitments.”

Phil Woodhall, Head of Product Management, Jungheinrich

Today, battery/ electric trucks account for around 50 percent of the counterbalance market.

as 90 per cent, reduce nitrogen oxide (NOx), and cut both particulate matter (PM) and carbon monoxide (CO) emissions.

Part of the paraffinic family of fuels, it is said to be clean and safe and meets all relevant fuel standards and EN 15940:2016 specifications.

Endorsed by a wide range of original engine manufacturers, HVO is synthetically produced using a complex refinery process that removes oxygen from vegetable oil and waste animal fat molecules and creates hydrocarbons very similar to regular diesel. But it is important to understand that HVO is not biodiesel: it's fundamentally different and, as such,

doesn't suffer from any of the negative issues sometimes associated with biodiesel.

Impurities are removed from the fuel during the production cycle leaving a consistent, quality product that significantly reduces harmful emissions from diesel engines.

To add to HVO's green credentials, only completely renewable materials are used in the production process and the crops from which the fuel is made are grown and harvested without damaging the environment or the natural ecosystem.

Already used to power a wide range of

modern vehicles as well as construction machinery and industrial power systems, HVO is considered an eco-upgrade on diesel because it is a fuel that not only reduces emissions and burns more cleanly but is also safer to handle than mineral diesel. While reduced particulate production during the combustion process reduces the ageing of engine oils and improves local air quality.

One of the biggest advantages of HVO is the fact that truck users do not need to modify their diesel-powered forklifts to use it – most industrial IC engines will run perfectly with HVO fuel.

A further plus-point is the fact that, because HVO is 100 per cent interchangeable with conventional fossil diesel, it can be blended at any ratio. So, forklift users can simply 'top-up and go' without any need to drain or clean fuel tanks. This ability to be interchanged with an absolute minimum of fuss has been recognised and most major engine manufacturers' warranties will support an instant switch from diesel to HVO.

Possibly the only down-side is that when it comes to price HVO is slightly more expensive than traditional diesel. However, with the high-profile of climate change and environmental concerns always close to the top of the business agenda, many lift truck users believe that the relatively modest extra cost is a price worth paying to be seen to be doing the right thing for the planet.



Driverless Forklifts

4 Driverless Forklifts

No matter how technically advanced a truck might be, the interface between the forklift and the operator remains crucial to maximising efficiency. **But across the Eurozone a shrinking labour pool is hitting the logistics sector hard and forklift operators are in short supply.**

While Covid and the economic and social upheaval that has followed in its wake is partly responsible for the current workforce crisis, other factors, including a falling population of 'prime age' workers, suggest that the problem isn't simply a 'bump in the road' but something with which the logistics industry will have to learn to contend in the long term. 13 per cent of respondents to a recent survey undertaken

by the leading trade association, Logistics UK, reported severe warehouse staff shortages, with a substantial decline in the availability of forklift drivers cited as a major problem.

The lack of workers means warehouse operators have to offer increased wages to attract personnel in the quantity and of the quality they need. Given that human labour is already one of the most significant costs associated with running a warehouse the handsome financial packages that are now required to tempt forklift operators are prompting more and more logistics companies to seek new ways of providing the same service levels with less staff.

For many, this means switching to automation and, unsurprisingly, for a growing number of Europe's warehouse and distribution centre operators, driverless forklift truck technology represents the optimum solution to the recruitment and employment cost challenges they face.

Driverless forklifts can undertake every type of task that would be expected of a traditional manually-operated forklift – including vehicle loading and unloading, pallet put-away and retrieval in both standard and very narrow aisle racking configurations, as well as pallet and stillage movements throughout the warehouse.

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Luyang Li
CEO
VisionNav Robotics



In addition to the obvious savings in labour costs that driverless forklifts bring, other benefits include reduced damage to goods, racking and trucks; greater picking accuracy; and more efficient use of the available storage space.

VisionNav Robotics is one of a growing group of companies that offer operator-free industrial vehicle manufacturers. The company's range of fully automated, vision-guided forklift trucks includes driverless counterbalanced trucks, reach trucks, stackers and tow tractors.

Worldwide, Nestle, DHL and Walmart are among the high-profile businesses that have adopted driverless truck systems, while countless small and medium sized forklift users are also benefiting from the solution.

In simple terms, the 'vision-based' navigation technology at the heart of VisionNav's operator-free forklifts uses a vehicle-mounted camera to sense the environment in which the vehicle is operating. Information concerning the structural design and storage system lay-out of the facility where trucks are deployed is stored as off-line maps which the visual navigation system matches with real time images received from the camera to navigate the forklifts efficiently and safely around the store. With multiple vehicles controlled by the system, the trucks are directed to their next location via the shortest, fastest and safest route for optimum throughput performance.

Co-founder and CEO of VisionNav Robotics, Luyang Li, comments: "When it comes to running a lift truck fleet, the forklift driver is often the biggest cost. Salaries, bonuses, training and other expenses combined with hidden extras such as the damage to goods or a building's infrastructure all add up to a considerable sum."

He adds: "When the cost savings they bring are added to the fact that driverless lift trucks eliminate the staffing issues created by the shortage of qualified forklift drivers, it is not surprising that more and more companies are adopting automated lift truck technology to optimise the efficiency of their warehouse intralogistics processes."

Jon Wickett from Essensium, providers of embedded AI forklift solutions adds: "Logistics directors and warehousing professionals have become increasingly aware of the importance of automation, digitisation, and AI which will only increase further as we approach 2050. I've heard these described as the 'new holy trinity', and their impact on the SMART, connected warehouse cannot be ignored."

Jon continues: "While the forklift is a mature product it, inevitably, will need to evolve. Change will be driven by customer demands and a growing emphasis on reducing carbon emissions and improving sustainability. Automation and semi-automation will become more prevalent, with increasing



Jon Wickett
Essensium





demand for unmanned vehicles. Fully automated forklifts can operate without a driver, reducing labour costs and increasing efficiency. Semi-automation provides a hybrid solution using technology to automate certain functions to improve drivers performance without investing in fully automated. As AI technology continues to advance, the automated & semi-automated forklift market will no doubt grow.

"Safety is also an important consideration; accidents in the warehouse are still all too common and as a result many organisations now aim for 'zero accidents' as a key objective. There have been huge investments in advanced safety features such as collision detection, proximity sensors and other driver aids. AI and digitisation technology can augment humans and alter behaviours in the SMART warehouse, this space will grow exponentially."

Jon concludes: "AI-booster technology will transform the warehouse and the technologies that work within them. Enhancing safety, supercharging productivity, and improving sustainability will become paramount. Embracing these advancements will ensure the continued success of businesses operating in the UK logistics sector."

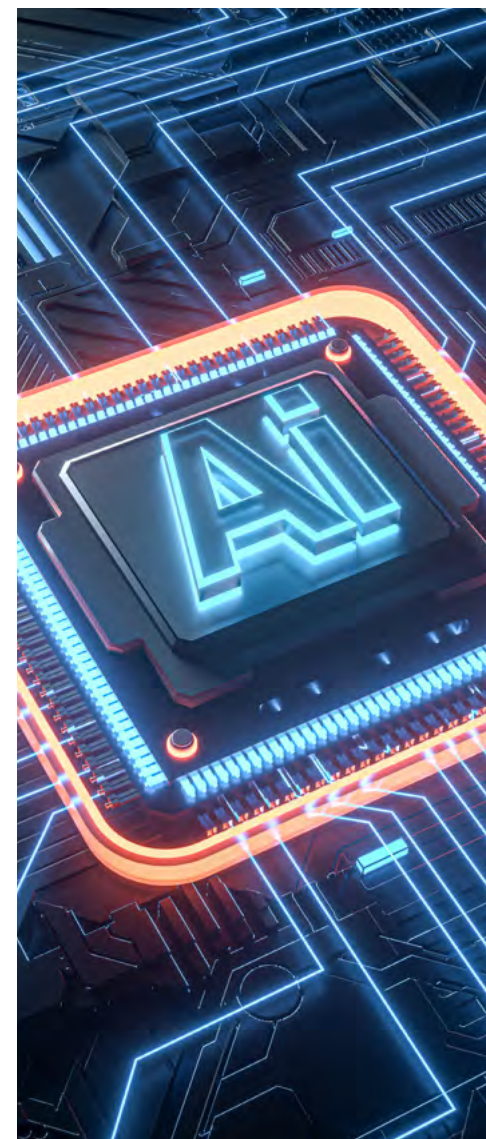
Combilift will be unveiling an automated product in the second half of 2023. The company's managing director, Martin

McVicar, comments: "There can be no doubting the fact that automation is playing ever larger roles in warehousing operations and suppliers like ourselves need to be aware of changing demands in this sector. But there will always be some scenarios when the combination of a human driver and a forklift will be preferable to automated systems, and suppliers will be expected to offer the best possible driver functionalities when it comes to comfort, ergonomics, safety and stress-free operation."

While the day may be fast approaching when the job of 'forklift driver' is added to the list of occupations that have all but disappeared thanks to developments in technology, for now at least, most lift trucks require a skilled operator. So, the world's leading forklift manufacturers continue to design-in improvements that make the operator's job easier, safer and, ultimately, more productive.

Combilift's Martin McVicar says: "Ergonomics is playing an ever more important role in forklift design due to a focus on the comfort and wellbeing of operators. We have gone to great lengths to ensure that the latest generation of models offer sophisticated ergonomics for a stress-free in-cab environment."

"A cornerstone of Combilift's design philosophy has been to supply handling solutions that not only enable space saving and productive handling but also reduce



risk and prevent accidents. In-house developments for safer operation include the multi-position tiller arm on the pedestrian models which allow the operator to remain in the safest possible position when working in narrow aisles - at the side of the truck rather than at the rear."

The efficient utilisation of traditional driver-operated forklifts depends to a large degree on the performance of the truck operator and actionable data plays a critical role in allowing managers to see which drivers are performing at a consistently high standard and, perhaps more importantly, which ones aren't.

Continuous developments in telematics technology are not only giving warehouse managers a better understanding of their intralogistics processes but also handing them the power to take greater control of their operation.

By using a combination of Global Positioning System (GPS) technology, sensors and vehicle engine data, modern telematics transforms each truck into a communications device capable of transmitting a chunk of valuable numbers regarding a forklift's performance – and, if required, an operator's - to a central information hub.

The three key areas that are arguably the most important to any warehouse or distribution centre manager charged with getting maximum value from his or her organisation's forklift spend - **lift truck productivity, safety and overall fleet running costs** – can all be optimised with the information gathered by telematics.

For example, for safety, GPS tracing functionality gives management sight of precisely where trucks are situated throughout the warehouse or distribution centre facility. In the event of an accident a telematics system should have the capacity to track and identify the exact point within the site where the impact occurred. This knowledge allows managers to identify any areas within their store where perhaps visibility could be improved, or other safety measures might be introduced.



“ There can be no doubting the fact that automation is playing ever larger roles in warehousing operations and suppliers like ourselves need to be aware of changing demands in this sector. ”

Martin McVicar, Managing Director, Combilift





With losses incurred by accidental damage to goods, a building's infrastructure, or the truck itself typically representing 5-15 per cent of a forklift's total operating costs, the ability to cut accidental damage can often make a convincing economic case for telematics technology - regardless of the fleet size.

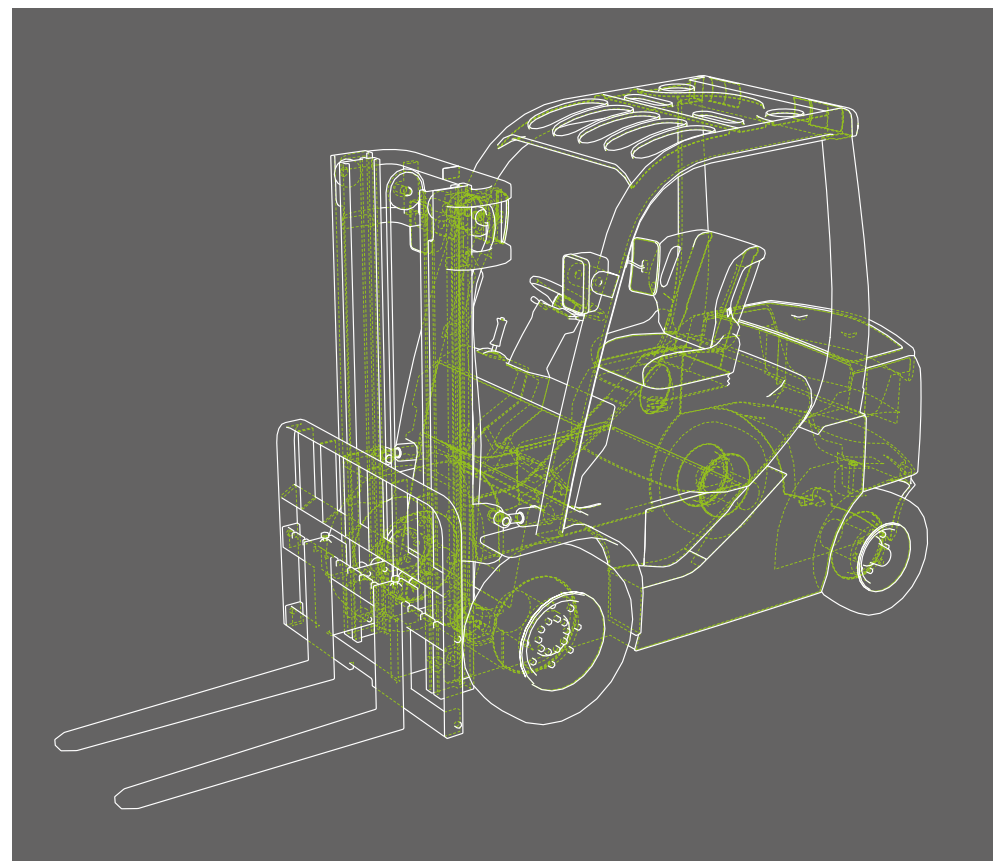
Of course, the tremendous benefits that modern trucks can bring to a business will only be enjoyed if the truck is actually able to function at a consistently high level – rather than spending most shifts parked up waiting for the arrival at the site of a mobile service engineer to bring it back to life in – ideally – the shortest possible time.

"Truck uptime will always be an important factor in the purchase decision," says David Bowen of Linde Material Handling.

He adds: "The needs of today's users of materials handling equipment revolve around cost-effective service. Large users of MHE seek to minimise fleets to keep costs down. This results in a requirement for equipment that is of a robust design, reliable and manufactured to a quality that ensures it can withstand the rigours of any application. That said, mobile equipment will always be prone to wear so a skilled servicing and repair force must be available – often 24/7 – to keep the fleets working efficiently."

"Digital truck control systems linked to a base station make external monitoring of individual pieces of equipment a practical proposition. This allows remote installation of updates to control software and any faults to be addressed before the operator or supervisor is even aware of them.

This increase in automation will contribute to greater machine reliability since removing the human factor will eliminate damage to trucks as well as excessive wear and tear through misuse."



Conclusion



5 Conclusion

Forklifts have been an icon of industry for almost a century.

Like every great machine, they have improved efficiency and safety beyond measure, and revolutionised the laborious and pain-staking work of lifting and moving goods from A to B.

There is no doubt that the design of the forklift will have evolved further by 2050 with clean and efficient fuels being at the forefront of change. Will we see more driverless fleets?

The answer is yes – automation, robotics and AI have seen boundless growth in the last five years and this will only be amplified as we get closer to the middle of the 21st century. However, the forklift will do what it has always done – adapt, redefine, and improve. Afterall it is an integral piece of kit for most, if not all, logistics operations.

Our thanks goes to our industry contributors who have expertly helped shape this report and we are looking forward to continuing the debate, in person, at the next IMHX which will be held from **9-11 September 2025** at the **NEC Birmingham**.

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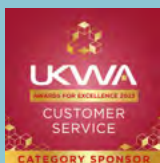
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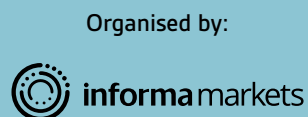


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