TCO Calculation of Leasing Concepts in Intralogistics

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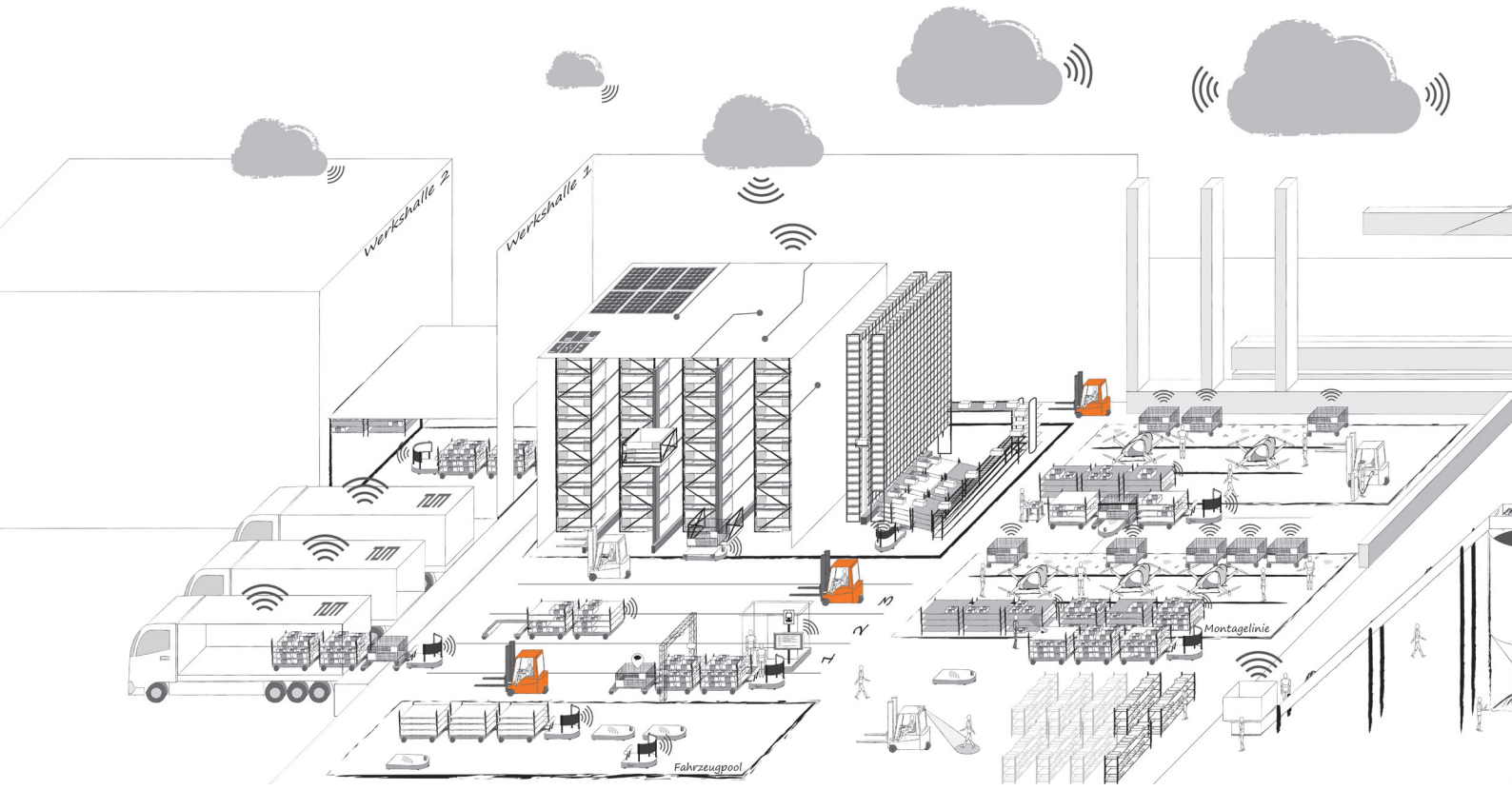

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Prof. Dr.-Ing. Johannes Fottner

Chair of Material Handling, Material Flow, Logistics
Technical University of Munich

Professor Dr.-Ing. Johannes Fottner has been the chair holder of the Chair of Materials Handling, Material Flow, and Logistics (fml) at the Technical University of Munich since 2016. After completing his Ph.D. in Mechanical Engineering in 2002, he worked in various management positions at the Swisslog Group until 2008. In 2008, he became the CEO of the MIAS Group. Since 2015, he has been the State Chapter Chairman for Bavaria and Deputy Chairman of the Production and Logistics Technical Society within the Association of German Engineers (VDI).

The authors

Dr.-Ing. Andreas Rücker

Chair of Material Handling, Material Flow, Logistics
Technical University of Munich

Andreas Rücker studied Mechanical Engineering at the Technical University of Munich. He has been a research associate at the Chair of Materials Handeling, Material Flow and Logisitcs since May 2016, and he completed his doctoral studies in 2022 with his dissertation on the energy efficiency of stacker cranes in automated high-bay warehouses.

Laura Grohs, M. Sc.

Chair of Material Handling, Material Flow, Logistics
Technical University of Munich

Laura Grohs studied Technical Computer Science and Control of Business Processes in cooperation with Ferrero MSC GmbH & Co. KG at the Technical University of Central Hesse. Subsequently, she worked as an IT Solution Architect in Material Flow. She has been a research associate at the Chair of Materials Handling, Material Flow, and Logistics (fml) since July 2022. Her research focuses on the Inbound Supply Chain.

Mathias Laile, M. Sc.

Chair of Material Handling, Material Flow, Logistics
Technical University of Munich

Mathias Laile studied Industrial Engineering at the Friedrich-Alexander University in Erlangen and then worked as a research assistant at the fml chair in the field of designing wheel-rail contacts for storage and retrieval machines.

Contents

Management Summary

Key Facts

- Focus: Leasing concepts in intralogistics and the comparison of leasing vs. purchasing.
- Premise: Total Cost of Ownership (TCO) is the relevant key figure for comparing acquisition concepts.
- Target audience: Operators, planners, and manufacturers of intralogistics systems.
- Industries: Automotive and vehicle manufacturing, electrical engineering and mechanics, machinery and plant engineering, consumer goods, and others
- Research method: Comparison of different scenarios using TCO calculation.

1. Background, Objective, and Study Design

Within the field of intralogistics, operators of vehicles and systems are frequently faced with the decision to invest in their existing system or opt for a new one. Leasing concepts, in conjunction with fleet management, play a crucial role in this decision-making process. These concepts are offered by manufacturers and specialized rental companies.

In intralogistics, commonly chosen investment objects include industrial trucks, referred to as FFZ, or automated guided vehicles, referred to as AGV. In the development of the leasing/fleet concept, an initial analysis is conducted on the customer's existing fleet, if available. This involves analyzing the FFZs based on their technical specifications, age, and operating hours, followed by the creation of a fleet concept.

As part of an exchange, an entire existing fleet can be bought up by the fleet/leasing provider, recycled and replaced with new equipment. At the end of the leasing contract, the customer has four options:

– they can choose to exchange it for a new device,
– extend the contract,
– purchase the device outright, or
– return the device and terminate the contract.

For companies, leasing intralogistic equipment such as FFZs and AGVs can be a sensible strategy to minimize costs associated with maintenance. Technologically specialized leasing providers recommend replacing the devices after a certain period of use, as service costs tend to increase with prolonged usage. The leasing rate is determined based on manufacturer offers for the considered vehicle. A corresponding residual value is also taken into account in the calculation of the leasing rate. After the primary period of use, the leasing provider sells the devices on the secondary market or repurposes them for a second use to realize the residual value. The use of leasing models for intralogistics equipment can thus contribute to higher planning security and a reduction in overall costs.

Leasing concepts for intralogistics equipment offer the advantage of flexible and individual terms, as well as usage models. This allows customers to better calculate their costs and adapt them to their respective needs. Another factor in favor of leasing is the ability to respond to current technical developments and requirements. Compared to purchasing equipment, leasing concepts, when the devices are optimally utilized, can result in lower overall lifecycle costs. Additionally, leasing brings the benefit of optimizing financial ratios. Depending on the type of accounting (German accounting (HGB) or International (IFRS / US GAAP)), these ratios may vary.

For companies following the German HGB accounting standards, leasing contracts can contribute to reducing fixed assets and depreciation costs, which has a positive impact on financial ratios. Furthermore, there are tax effects such as pre-tax deduction eligibility and the possibility of utilizing special depreciation that can make leasing intralogistics equipment worthwhile for companies. In addition to leasing individual logistics vehicles or entire fleets, the outsourcing of complete logistics processes within a company is possible. In this scenario, a service provider takes on all logistics and transportation tasks.

Companies operating fleets of FFZs or AGVs often face challenges in determining usage cycles and replacement times due to a lack of market and technology knowledge. Additionally, there is often a lack of know-how in capturing and evaluating the TCO.

Therefore, specialized leasing companies with relevant market expertise offer fleet management services to their customers. These services include:

Overview
The customer receives a comprehensive overview of the entire fleet. Vehicle data is centrally collected, enabling efficient and transparent management.

Replacement Plan
Fleet management provides a well-thought-out replacement plan for the vehicles. This ensures that the fleet is always equipped with modern and efficient vehicles, leading to optimized performance and cost savings.

Adjustments
If necessary, adjustments can be made to the fleet to meet changing requirements. Fleet management enables flexible scaling of the fleet according to the current business needs.

Return Flexibility
Customers have the option to flexibly return or extend the vehicles after the lease period expires. This provides high flexibility and planning security.

Cost Efficiency
Through effective fleet management, companies can reduce costs and increase overall efficiency. An optimized fleet with reduced downtime and lower maintenance costs results in an improved cost balance.

Objective

The aim of this study is to compare different utilization models and cycles of commonly used FFZ and AGV types. It is intended to provide operators of intralogistics facilities with universal guidance for evaluating and selecting various deployment scenarios. In addition to examining FFZs and AGVs, the study also aims to provide an outlook on outsourcing options for complete intralogistics systems as a further possibility.

Within this investigation, three different scenarios are considered.

- Scenario I describes the comparison of the TCO of FFZs in the case of a purchase versus leasing models.
- Scenario II examines the use of AGVs as an alternative to manual FFZs for the same transport task. Purchase and leasing options are also presented in this scenario.
- Scenario III outlines possibilities for outsourcing complete intralogistics systems.

The evaluation of the first two scenarios is based on TCO calculations using a simulation model. Building on this, the goal is to determine under which conditions leasing of devices in intralogistics is beneficial. The influences of individual factors on TCO will be highlighted. The advantages and conditions of Scenario III will be explained through a case study.

The focus of this study is exclusively on operational leasing. In this form of leasing, the lessee uses FFZs or AGVs for a specified period without entering into a long-term commitment regarding ownership or maintenance.

Structure of the study

Following the description of the initial situation and objectives in Chapter 1, Chapter 2 provides an explanation of the structural data underlying the study. Subsequently, Chapter 3 describes the calculation model used, with particular emphasis on the assumptions in the calculation and knowledge-based factors. The individual scenarios are presented in Chapter 4. Chapter 5 summarizes the key findings and provides an outlook.

2. Structural Data

To examine the various scenarios of the study, it is necessary to analyze the structural data of the simulation model in detail. In particular, the relevant parameters that significantly influence the TCO calculation will be examined. Only through a thorough analysis of the structural data can meaningful results be achieved, demonstrating when leasing intralogistics equipment, such as FFZs or AGVs, becomes cost-effective compared to purchasing.

What data does the study rely on?

The data used in this study to calculate the TCO of FFZs and AGVs are based, among other sources, on real-world practical data gathered from companies in various industries and regions.

The data was collected and analyzed by CHG-MERIDIAN Industrial Solutions GmbH in collaboration with the study authors. Additionally, TCO calculations from other providers were analyzed for the development of the calculation model.

For certain parameters, such as investments in FFZs or their operational costs, assumptions were made regarding future developments and trends in the industry. These assumptions are based on an analysis of market data, empirical values and forecasts from experts in the industry. As a result, the outcomes of the TCO calculations are to be considered realistic and meaningful for practical application.

In general, general parameters like the desired service lifespan in years, the battery and charging technology, as well as specific cost factors like necessary investments, operation-dependent costs, capital costs, administrative costs, and rollout/rollback & disposal costs were considered. The data was generalized, meaning it was not manufacturer-dependent.

With regard to maintenance and repair costs, the study examines the Service&Repair and Full-Service models. In a Full-Service model, all services are included in a monthly fixed rate for a specified duration, covering regular maintenance, repairs, spare parts, and potentially vehicle replacement. Conversely, with Service&Repair, the calculation of all costs is based on usage. The choice between the models depends on the individual requirements and preferences of the customer. The Full-Service model offers comprehensive support and cost control, while the Service&Repair model provides higher flexibility and may lead to cost advantages in scenarios with low usage.

What necessary knowledge is required for evaluating leasing concepts?

To evaluate leasing concepts, customers need knowledge in the following areas:

Technical Knowledge
A technical understanding of different types of vehicles is crucial to assess the suitability of the equipment for specific tasks and operational requirements.

Financial and Accounting Expertise
To evaluate the total cost of an FFZ or AGV over its entire lifespan, various financial and accounting aspects must be taken into account, including leasing costs, depreciation, taxes and financing costs.

Logistics and Operational Knowledge
The impact of FFZs or AGVs on logistics processes and operational workflows must be assessed to optimize the efficiency and profitability of forklift usage.

3. TCO-Calculation

The calculation model used in the study serves to evaluate the TCO of manual FFZs and AGVs in the case of purchase and leasing.

Calculation for manual FFZs

Data basis
The data basis for the TCO calculation considers the following parameters: data on investments, operating duration and type, operation-dependent costs, administrative costs, imputed interest rates, leasing terms, and disposal.

Investments include the acquisition costs of the FFZs as well as the batteries and charger. The operating duration is determined by the number of operating hours and annual operating days, as well as the desired usage lifespan in years. The operating type depends on the defined categories according to VDI 2695 [VDI-2010]. The data from the operating-dependent costs consists of several components. To determine energy costs, both electricity costs and battery charging data must be considered. Additionally, for diesel-powered FFZs, manufacturer specifications for fuel consumption are relevant. Maintenance costs include the expenses for service, inspections, and repairs due to wear. These costs increase annually due to the growing age and total operating hours. Administrative costs primarily encompass labor costs and, in exceptional cases, additional licensing fees. Regarding leasing terms, the leasing duration and potential extension options are relevant.

TCO-calculation: purchase
One component of the TCO in the case of a purchase consists of depreciations. Generally, all investments are depreciated over a period of eight years. Additionally, special depreciations, investment allowances, or increased deductions for certain acquisitions may be considered. Furthermore, the annual maintenance costs and their individual trajectories are evaluated. Specific events, such as the necessary replacement of batteries, are also taken into account. Another component of the TCO is the administrative costs, which comprise defined labor costs, fleet size, licensing fees, and the shift model. The capital costs are individually determined based on the imputed interest rate and the financing structure. Additionally, a potential residual value at the end of the useful life is considered.

TCO-calculation: leasing
The calculation of TCO in the case of leasing is structured similarly to the purchase scenario. Instead of depreciations, leasing rates are calculated based on the vehicle model and the operating duration. The calculation of maintenance costs is analogous to the calculated costs in the purchase scenario. One difference is the fleet exchange after half of the operating duration. This results in a decrease in maintenance costs in the first year after the exchange, followed by an increase. Energy costs also decrease after the exchange of FFZs, assuming an improvement in the energy efficiency of FFZs and battery technologies. Ultimately, due to the shorter usage time of individual FFZs, the need for battery replacement is potentially eliminated.

TCO calculation for AGVs

The calculation for AGVs is based on that for manual FFZs with some changes and expansions to adapt to AGVs.

A significant addition is the consideration of project costs, for example, for the implementation of a software system to control the AGVs and their tasks. These are evaluated as investments and depreciated in the purchase situation similar to other investments. In the case of leasing, they are included in the leasing rate.

Another change is in the calculation of operation-dependent costs. These only increase according to an assumed realistic annual price escalation. Downtimes are not considered, as it is assumed that AGVs do not experience failures.

Furthermore, for AGVs, comprehensive refurbishment in the sixth year is assumed, amounting to 10 percent of the acquisition costs. A change of the lithium battery in the case of purchase is considered in the tenth year [Eat-o.J.]. In the case of leasing, a fleet exchange is planned in the eighth year.

4. Usage scenarios

The usage scenarios of FFZs and AGVs with lifting capabilities are widespread in the logistics industry. Both systems can be employed in a warehouse or production facility to automate and optimize the transport and processes of goods. The combination of AGVs with lifting functions allows the system to autonomously pick up goods from one storage location and transport them to another by using the lift to raise or lower the goods to the desired height.

Manual industrial trucks

In this subchapter of the study, the focus is on comparing FFZs in terms of purchase or leasing. Particularly, the structural data of the simulation model from CHG-MERIDIAN Industrial Solutions GmbH for TCO calculation will be considered. The goal is to demonstrate under which conditions leasing FFZs in intralogistics is advantageous and which factors play a crucial role.

Description

Within this study, a comparison of various types of forklifts was conducted. This included diesel forklifts (Diesel-FL), electric high-lift trucks (Electric-HLT), electric forklifts (Electric-FL), and reach trucks (Electric-RT) with load capacities of 1.6 t, 3.0 t, and 5.0 t for 1- and 2-shift operations with service life of 8, 10, and 12 years respectively. A service life of 12 years was not considered in 2-shift operation due to its lack of practical relevance. This decision is based on the assumption that intensive usage leads to higher wear and potentially higher maintenance costs, making it less relevant for customers.

The scenario aims to conduct a comparative analysis of the TCO of different types of FFZs, providing decision support for companies choosing between purchase or leasing models. By considering various load capacities and vehicle types, the relevance and applicability of the results are increased for a variety of companies and industries.

For the different vehicle types, costs for the Service&Repair model were considered. Additionally, for an Electric-FL with a nominal load of 1.6 t, 2-shift operation, and a service life of 8 years, the Full-Service model was examined.

Scenario Ia

In this Scenario Ia, an investigation into the profitability of leasing was conducted. The following criteria were considered:

- FFZ types: Diesel-FL and Electric-FL
- Nominal Load: 1.6 t, 3.0 t, 5.0 t
- Different service lives of 8, 10, and 12 years
- Consideration of shift operation (1-shift and 2-shift)
- Utilization of the service model Service&Repair

These factors were analyzed to determine at what point leasing forklifts becomes economically advantageous.

Figure 1 is based on the TCO calculation described in Chapter 3. Based on the given Scenario Ia, it can be observed that leasing is not economically advantageous for certain Diesel-FL models with nominal loads of 1.6 t, 3 t, and 5 t with a service life of 8 years in 1-shift operation. Similarly, a Diesel-FL with a nominal load of 5 t with a service life of 10 years in 1-shift operation does not allow for any savings. In contrast, savings can be achieved every year for Electric-FL models.

However, it is essential to note that the men-

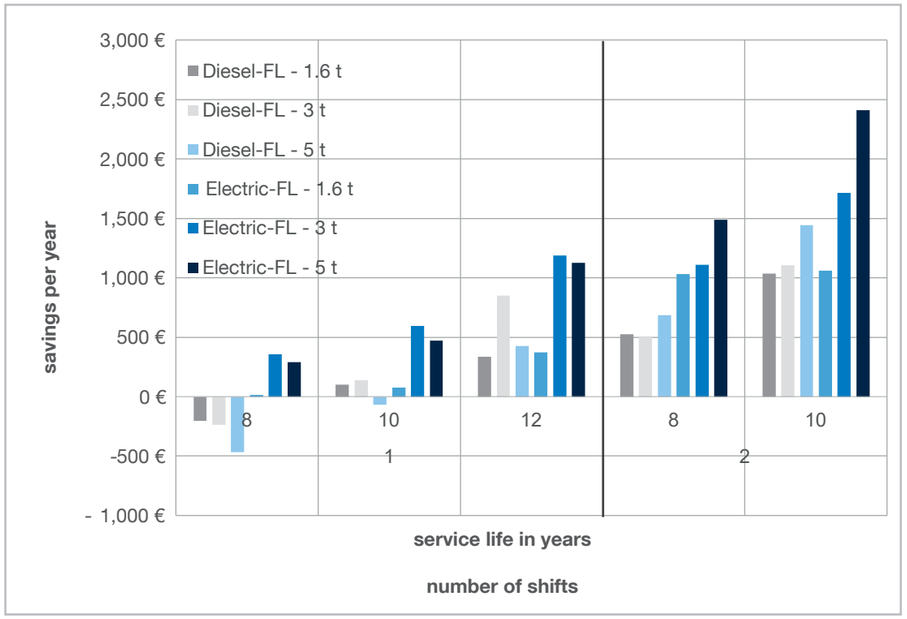

Figure 1: Cost savings by leasing a Diesel- and Electric-FL compared to buying one.

tioned scenarios do not correspond to the optimal usage cycle in each case. This is exemplified in Figure 2. It depends on the respective vehicle type and shift model. For these combinations, different trajectories of residual value and maintenance costs define the optimal usage cycle.

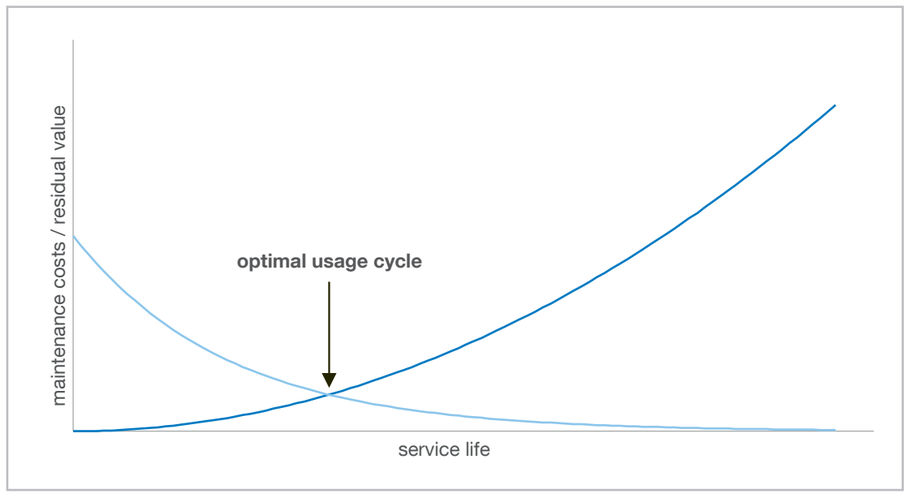

Figure 2: Example of an optimal usage cycle.

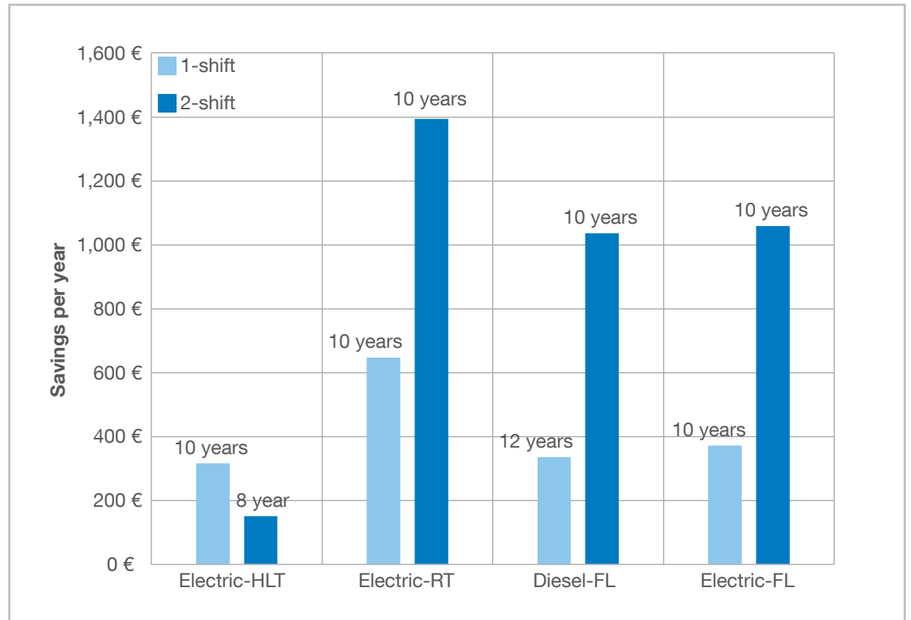

Figure 3: Cost savings through leasing for 1.6 t vehicles in the optimum usage cycle.

Using the optimal cycle in each case results in savings for all types of FFZ considered in the case of leasing compared to purchasing. These are shown in Figure 3.

The recommended service life maximizes the benefits of leasing and improves operational efficiency. However, a thorough analysis of specific requirements and conditions is crucial for selecting the optimal service life.

The presented results emphasize the importance of careful planning and alignment of the leasing duration with the specific requirements of a FFZ. It is recommended that companies conduct a thorough analysis when selecting FFZs to determine the optimal service life and make economically sound decisions.

An effective service life, aligned with operational needs and technical characteristics of the vehicles, can lead to cost savings and improved operational efficiency.

Scenario Ib

Within the scope of Scenario Ib, the current practice of purchasing FFZs with the "Service&Repair" service model is compared with the leasing of FFZs using the "Full-Service" service model. The comparison considers the following criteria:

– FFZ-Type: Electric-FL
– Nominal load: 1.6 t
– Service life: 8 years

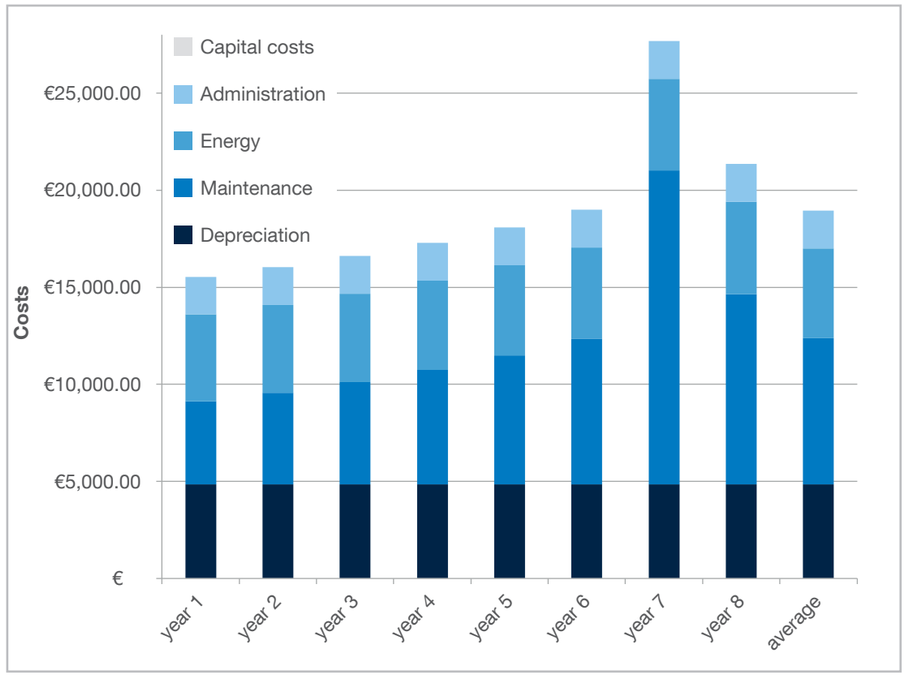

Figure 4: Annual costs of the examined Electric-FL in the case of purchase - Service&Repair

– Shift Operation: 2-shifts
– Utilization of the Service Models: Service&Repair and Full-Service

In summary, when comparing the purchase of Electric-FL with the Service&Repair model to the combination of leasing and the Full-Service model, the following findings arise:

For the Electric-FL in Figure 4 with the Service&Repair model, the total costs over the 8-year service life amount to €151,550.18, with average costs of €18,943.77 per year. In year 7, the necessary battery replacement is included in the maintenance costs.

In comparison, Figure 5 shows the total costs for the Electric-FL in the case of leasing with the Full-Service model amounting to €142,423.46 over 8 years, with average costs of €17,802.93 per year. The replacement of the FFZ after 4 years eliminates the cost-intensive battery replacement.

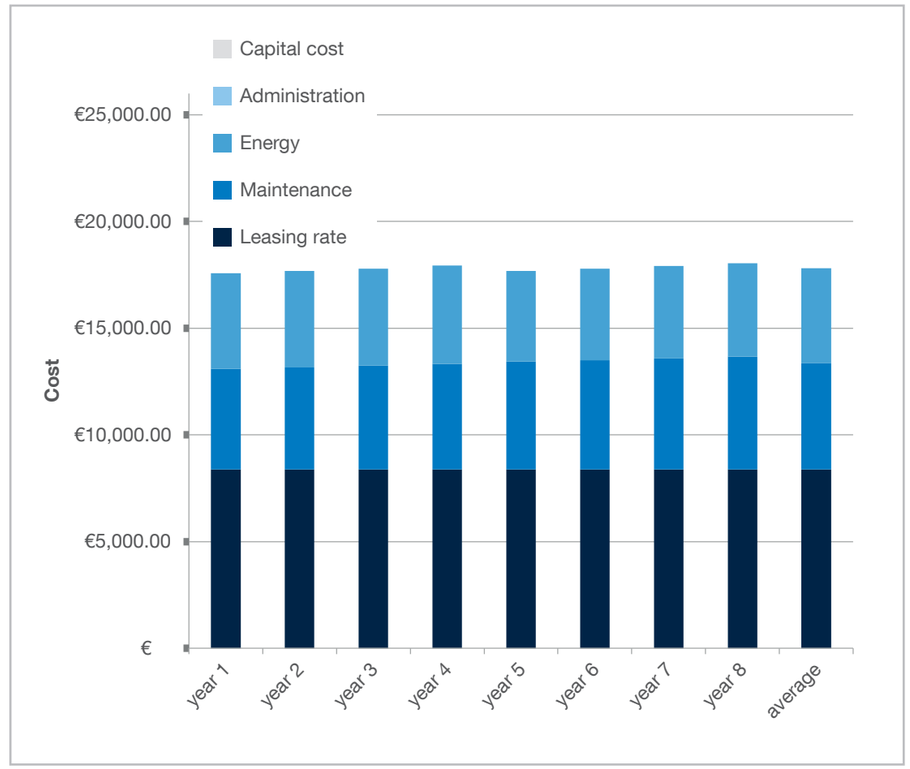

Figure 5: Annual costs of the examined Electric-FL in the case of leasing - Full-Service

The cost benefits of the leasing option in conjunction with a Full-Service model are clearly demonstrated in this example:

Cost Savings
Leasing with a Full-Service model results in overall lower total costs over the service life. Customers benefit from a better cost-benefit ratio and can make their budget planning more stable.

Cost Stability
The contractually agreed price structure of the Full-Service model provides a certain price protection against external influences such as inflation. Customers can benefit from long-term stable prices and avoid potential cost increases. Additionally, with the fleet replacement after 4 years in the case of leasing, the additional cost of replacing the battery in year 7 is eliminated. Overall, the annual costs over the service life are significantly more constant and predictable.

Furthermore, this option provides additional benefits:

Support
The Full-Service model offers support beyond mere maintenance and repairs. It in-

cludes the replacement of defective parts and assistance with unforeseen events. This enhances the productivity of the warehouse operation and minimizes downtime. In the case of major repairs, the customer also receives a replacement vehicle for the duration of the repair.

Security
The Full-Service model can be considered a form of security. Customers have the assurance that their fleet is always operational, and any unforeseen costs are covered. The availability of FFZs is maximized, increasing the efficiency of warehouse operations.

Overall, the mentioned advantages favor leasing with the Full-Service model. It provides comprehensive support, cost savings, security, and price stability. Customers can thus focus on their core business while benefiting from the advantages of professional fleet management.

Interim Conclusion

The present study provides insights into the savings achievable through the leasing of FFZs with a particular emphasis on the primary contributor to these savings: service costs. The analysis of the impact of wear and tear on machines and the associated service costs highlights that a targeted selection of the optimal usage cycle for the specific combination of FFZ type and shift model, coupled with regular vehicle replacement, can lead to significant cost reductions.

One aspect involves the avoidance of repairs due to the low age of the vehicles. Early leasing vehicle replacement ensures that the vehicles are in good condition, thereby requiring fewer repairs. Additionally, differences arise in terms of residual value and market value when comparing purchasing to leasing. The study underscores the importance of a meticulous analysis of these financial aspects when choosing the appropriate usage model.

Another crucial factor is the optimized service life of FFZs. It is recommended to retire old vehicles early and consider their optimal service life (see Figure 2). Systematic planning and the targeted use of FFZs in line with their optimal service life can result in cost reductions.

Furthermore, the study indicates that FFZs leasing can lead to savings in TCO. Beyond direct savings in service costs and repairs, indirect savings from more efficient usage and the deployment of newer, more energy-efficient technologies must be considered. Particularly, energy costs can be reduced through leasing. A swift transition to more efficient technologies, such as using Electric-FL instead of Diesel-FL, can yield savings in energy costs, such as diesel expenses.

In conclusion, the study illustrates the diverse saving potentials offered by FFZs leasing. From optimizing service costs to targeted service life and reducing overall costs and energy expenditures, companies can gain advantages through the leasing model. However, it is crucial to emphasize that a careful analysis of the specific requirements and conditions of each company is essential when deciding on FFZs leasing.

AGVs with Lifting Function

Requirements for implementation
AGVs are increasingly employed in the logistics sector to automate manual processes and enhance efficiency and safety [Ehr-o.J.; BÄR-o.J.; Lei-2019]. However, to ensure a successful implementation of AGVs, various factors need to be considered. The key aspects of introducing AGVs in logistics are outlined below.

Infrastructure
It is crucial that the company's infrastructure is tailored to accommodate AGVs, ensuring seamless integration. This involves installing specific sensors and markings on the floor for AGV navigation [JBT-o.J.]. Moreover, transfer points between manual and automated technology must be defined, and if necessary, the warehouse layout should be adjusted.

Flexibility
AGVs must be capable of adapting to various requirements and performing different tasks. A detailed analysis of the requirements and potential scenarios can help determine the necessary flexibility of AGVs [Jes-2020; Mes-o.J.].

Safety
Ensuring safety during the use of AGVs is paramount to protect employees, other machines, and materials. Appropriate safety measures must be implemented, and training for operational and maintenance personnel is required [Lei-2019].

Integration
Integrating AGVs into IT systems and operational processes is a crucial aspect of their introduction. Careful integration of systems is necessary to enable effective utilization of AGVs [SEP-o.J.; SIE-2022; agv-2021].

Costs
The investment in AGVs is typically higher than using manual FFZs. A comprehensive cost-benefit analysis is necessary to weigh the expenses of introducing AGVs against the expected benefits [Sha-2019].

Description
Building upon scenarios involving various types of manuals, the study conducted a comparison of the TCO between AGVs and FFZs. This was based on a reference scenario, comparing an exemplary FFZ type und an AGV type, with TCO calculated for leasing in both cases.
The chosen reference FFZ is a 1.6 t Electric-HLT. This is juxtaposed with a comparable 1.6 t AGV. The assumption is that 6 Electric-HLT, used for the handling of grid boxes, are replaced by 12 AGVs, as derived from an expert discussion. The considered scenario also involves a 2-shift operation and a service life of 10 years.

A significant difference between the use of Electric-HLTs and AGVs lies in the personnel involved. For manual FFZs, operators need to be considered, i.e., one person per FFZ per shift. Personnel costs, amounting to €55,000 per person, including fringe benefits, are assumed [Kun-2023; Qon-2022]. For all 12 AGVs, 0.5 employees per shift are necessary for operating the control station and monitoring. Personnel costs for this scenario are €60,000, including fringe benefits.

The purpose of this scenario is to conduct a comparative analysis of the TCO of man-

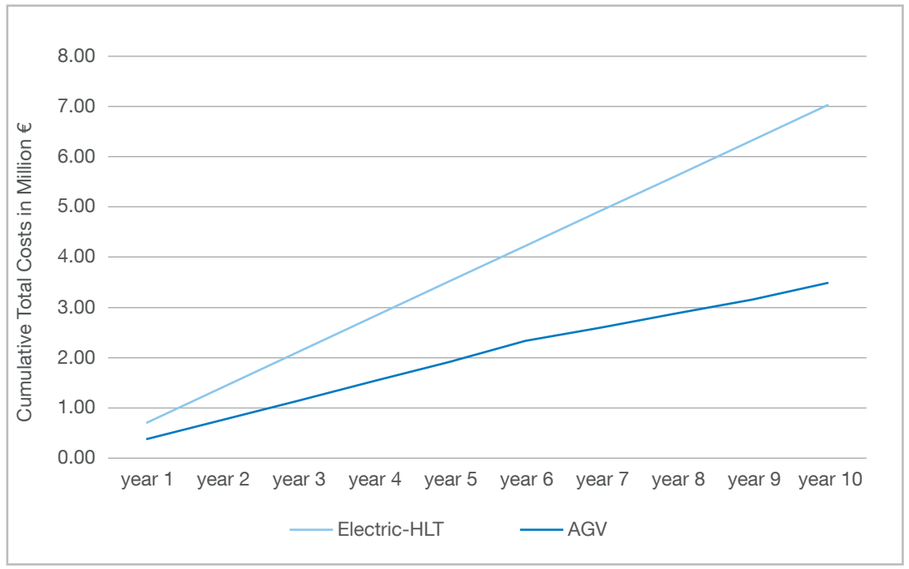

Figure 6: Comparison of cumulative costs

ual FFZs and AGVs in the case of leasing, aiming to determine whether the automation of the described logistics process is cost-effective.

Results

Figure 6 illustrates the comparison of cumulative total costs using 6 Electric-HLTs und 12 AGVs. The figure demonstrates that, in the examined scenario, the use of AGVs is advantageous over manual FFZs from the first year of operation onward. This advantage continues to grow over the course of the service life. In total, the examined scenario results in savings of approximately €3.6 million or 50%.

Table 1 presents the average costs for the comparison, subdivided into cost types. The main driver of savings is personnel costs, amounting to €660,000 per year for manual FFZs compared to €60,000 when using AGVs. Over the service life, savings in personnel costs become increasingly significant, leading to a cumulative increase in savings. It's worth noting that personnel costs depend heavily on the chosen shift model, with a more substantial difference in TCO between manual FFZs and AGVs in a 3-shift model than in the examined scenario. Conversely, a 1-shift model results in a smaller difference.

Other cost categories are higher for AGVs. The increased leasing rate stems from higher acquisition costs and project costs for AGV implementation. Higher maintenance costs result from a larger number of vehicles and assumed higher maintenance costs per vehicle. In the case of AGVs, energy costs are approximately double. This is based on the simplified assumption that an AGV covers

Table 1: Average costs over a 10-year period in scenario II in €.

	Leasing rate	Maintenance costs	Maintenance costs	Energy costs	Personnel costs
Electric-HLT	20,596	15,054	0	8,008	660,000
AGV	173,719	83,878	14,440	14,440	60,000

the same distance per year as a manual FFZ but requires twice the number of vehicles for the transport task. However, in reality, due to the larger number, it can be assumed that a single AGV covers shorter distances than a manual FFZ. Therefore, in reality, the energy costs of AGVs may be lower.

Interim Conclusion

In summary, the results of the scenario analysis indicate that automation through the use of AGVs is beneficial for the examined logistics process. The higher leasing rates compared to manual FFZ vehicles are offset by savings in personnel costs, starting from the first year in the investigated scenario. Additionally, two simplifications in the calculation negatively affect the TCO for AGVs compared to manual FFZs. These involve energy costs, which are approximately double for AGVs in the considered comparison. In reality, the difference in energy consumption between manual FFZs and AGVs is expected to be smaller. Furthermore, the calculation of TCO for manual FFZ assumes one employee per FFZ and shift, a factor that is likely higher in reality due to holidays and sick leave.

Leasing offers greater flexibility compared to purchasing the AGV fleet. Instead of high acquisition and project costs that must be realized directly in the first year, leasing involves even and predictable rates over the service life. Furthermore, a TCO comparison reveals savings of approximately €215,000 or 5.8 percent when using leasing compared to purchasing AGVs.

However, the results of the examined scenario cannot be universally applied to every logistics process. There are scenarios in which automation may not be cost-effective. The benefits of AGV deployment depend heavily on the specific tasks at hand. Therefore, a case-by-case examination is advisable. Nevertheless, the results demonstrate that deploying AGVs has the potential for significant cost savings compared to manual FFZs. Therefore, conducting a TCO calculation is recommended in every case, as it provides a basis for well-informed decisions regarding the automation of specific logistics processes.

Efficient Intralogistics-Outsourcing: Contract-Logistics

In addition to leasing individual vehicles in intralogistics, the outsourcing of the entire logistics process is possible, where a service provider takes on the role of managing the vehicle fleet or the complete execution of a company's intralogistics, including warehousing and transportation. This study explores the benefits and necessary conditions of outsourcing through a case study.

The focus is on an internationally operating company in the food industry specializing in the production of confectionery and other food products. To efficiently bring its products to market, the company has extensive warehousing and logistics resources.

In terms of warehouse management, outsourcing offers several advantages for such companies:

Cost Efficiency
Outsourcing warehouse management allows companies, like the one in the case study, to optimize operational costs. External service providers possess specialized expertise and infrastructure to ensure efficient warehouse processes. This enables the company to leverage economies of scale and reduce costs by sharing warehouse resources with other businesses.

Expertise und Resources
External warehouse management service providers have extensive experience and expertise in warehouse organization, inventory management, and logistics processes. Through outsourcing, companies can benefit from this expertise and tap into a broad pool of resources to effectively optimize their warehouse activities.

Focusing on Core Competencies
By outsourcing warehouse management to an external service provider, the company can concentrate on its core competencies, namely, the production of high-quality confectionery. Transferring warehouse management to specialists allows the company to allocate resources and attention more intensively to product innovations and customer service.

Scalability and Flexibility
Outsourcing in warehouse management offers the possibility to flexibly adjust warehouse capacities to current needs. During seasonal fluctuations or changing market conditions, warehouse capacity can be quickly expanded or reduced to ensure optimal resource utilization. This provides higher flexibility and agility in warehouse management.

Technological Advancements
External warehouse service providers are often up-to-date with the latest technology, possessing advanced warehouse management systems and automation technologies. Through outsourcing, the company can benefit from these technological advancements, further enhancing the efficiency of its warehouse processes.

In summary, outsourcing warehouse management offers a range of benefits for companies like the one in the case study. Collaboration with external service providers can lead to cost savings, utilization of expertise, optimization of resources, and increased flexibility. This allows the company to focus on its core competencies while ensuring efficient warehouse processes to successfully bring its high-quality confectionery products to the market.

However, certain conditions should be considered when outsourcing warehouse management to ensure the success and efficiency of the process. These include:

Clear Communication
Transparent communication between the company and the external service provider is crucial. Clear expectations, requirements, and goals must be defined to avoid misunderstandings and ensure smooth collaboration.

Contractual Agreements: It is important to document all agreements and responsibilities in a contract. This includes aspects such as the scope of services, service-level agreements, confidentiality, liability, and termination clauses. A carefully crafted contract provides clarity and security for both parties.

Data Privacy and Security: As warehouse management involves sensitive company data, adequate data privacy and security of the warehouse infrastructure are of great importance. The external service provider should take measures to ensure the confidentiality and integrity of the data and adequately secure warehouse locations.

Flexibility and Scalability
The warehouse solution should be flexible and scalable to meet the changing needs of the company. This includes the ability to expand or reduce warehouse capacities as needed, as well as providing technologies and systems that allow for future adjustments.

Monitoring und Reporting
An effective monitoring and reporting system is essential to monitor and evaluate the performance of the external service provider. Regular reports on performance indicators such as inventory availability, lead times, error rates, and customer satisfaction should be generated to ensure the quality and efficiency of warehouse management.

Continuous Collaboration and Improvement:
Warehouse management should be viewed as a collaborative partnership between the company and the external service provider. Regular meetings, feedback loops, and continuous improvement measures are necessary to achieve optimal performance and efficiency.

By considering these conditions, the outsourcing of warehouse management can be successfully implemented, and companies, as in the case study, can benefit from the advantages of this strategic decision.

5. Summary and outlook

This study focuses on examining the advantages and disadvantages of fleet and leasing concepts for intralogistics equipment, specifically FFZs und AGVs. Costs can be saved through leasing and selecting the right usage cycle. The optimal usage cycle varies depending on the vehicle type and shift model. After the lease contract expires, customers can choose from four options: replacement with a new vehicle, contract extension, purchase of the leased vehicle, or return and termination of the contract. Specialized lessors also offer additional fleet management services, which come with further benefits. The study compared different usage models and cycles of commonly used FFZ and AGV types to analyze cost advantages.

Three different scenarios were analyzed:

– I Purchase or leasing model of FFZs
– II Use of FFZs compared to the use of AGVs
– III Leasing of a complete intralogistics system

In Scenario I, it was revealed that leasing has significant potential for cost savings compared to purchasing when considering the optimal service life of vehicles. Leasing is worthwhile for all vehicles studied in the scenario, provided the optimal service life of the respective vehicle type is considered based on the shift model. Furthermore, an exemplary calculation of a typical Electric-FL showed additional potential for cost savings by combining leasing with a full-service approach.

In Scenario II, a typical logistics task using manual FFZs was compared with the use of AGVs, demonstrating significant potential for cost savings through the automation of logistics processes with AGVs.

Scenario III was explained using a case study to highlight outsourcing opportunities for warehouse logistics.

The results of the study illustrate the advantages of leasing intralogistics vehicles, the cost-saving potential of AGVs in intralogistics, and the benefits of outsourcing warehouse management. It is evident that companies can optimize their logistics processes and focus on their core competencies through the use of leasing concepts and outsourcing of warehouse management. However, it is essential to note that individual analyses and adjustments are necessary to consider the specific requirements of each company. A blanket recommendation cannot be given.

Future studies can focus on further analyzing varying results depending on the use case and industry, identifying optimal usage and leasing cycles for different devices and requirements. It would also be valuable to examine the financial impacts of transitioning to more efficient devices over time and analyze the direct and indirect savings potential of leasing versus purchasing in different industries and use cases.

The use of AGVs, especially in combination with advancing technological progress, holds promising potential for the future. The impacts of increasing automation and technological innovation on the profitability of leasing versus purchasing models are of particular interest. Furthermore, the growing trend of outsourcing warehouse management and the associated challenges and opportunities should be further explored.

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Chair of Materials Handling, Material Flow, Logistics
TUM School of Engineering and Design
Technische Universität München

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