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RESEARCH ARTICLE

ENHANCING EQUIPMENT FLEET AVAILABILITY USING GEMBA LEAN TOOL: A CASE STUDY IN HEAVY TRUCK AND TANK TRAILER REPAIR SHOP

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Abstract

Purpose: The purpose of this paper is to leverage the Gemba lean tool to study and enhance fleet management practices inheavy truck and tank trailer repair shop operations. Gemba, often referred to as "the real place where things happen," provides a framework for observing and improving processes directly at the site of operations (Imai, 2016). By applying this approach, the research aims to gather and analyze data on the current fleet management practices at heavy truck and tank trailer repair shop operations and identify areas for improvement. The focus is on examining how fleet availability impacts overall business productivity, especially in a service-repir industry where timely equipment functionality is crucial.

Design/Methodology/Approach: This research is based on primary data collected over an 8-month period using a fleet utilization template. The methodology involves evaluating the extent of fleet utilization and the impact of equipment downtime on the business operations of heavy truck and tank trailer repair shop. The collected data was analyzed to understand the correlation between equipment availability and employee productivity. Additionally, the study examines how maintenance practices—or the lack thereof—affect fleet downtime and, subsequently, the operational efficiency of the business.

Findings: The research findings reveal a clear relationship between equipment availability and employee productivity. In small service repair businesses, maintaining fleet availability is often overlooked, yet it plays a significant role in meeting business objectives. The study found that prioritizing fleet maintenance could significantly reduce equipment downtime, thereby improving fleet availability and enhancing employee productivity. These improvements would help businesses like heavy truck and tank trailer repair shop achieve their strategic goals more effectively, by ensuring that employees have the necessary tools to perform their tasks without interruption. This research highlights the need for management in small businesses to adopt more proactive fleet maintenance strategies to increase productivity and overall operational efficiency.

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Introduction:-

In heavy truck and tank trailer repair operations, the availability and proper maintenance of internal equipment are critical to ensuring operational efficiency, minimizing downtime, and enhancing the overall effectiveness of the fleet. One of the most effective methods for improving equipment availability and fleet performance is the application of the Gemba approach.

The term Gemba, which means "the real place" in Japanese, originated within the Toyota Production System (TPS) and plays a critical role in Lean management and continuous improvement processes. Gemba refers to the physical location where work is done and value is created, such as the shop floor in manufacturing. The concept gained prominence as part of Toyota's emphasis on problem-solving and process improvement by going directly to the source, a practice known as the Gemba Walk. This hands-on approach allows managers and leaders to observe operations firsthand, engage with employees, and identify inefficiencies or areas for improvement (Imai, 2016). Gemba is rooted in Toyota's commitment to kaizen, or continuous improvement, and has since been applied across various industries beyond manufacturing, including healthcare, logistics, and services. By focusing on direct observation and problem-solving at the source, Gemba helps organizations achieve better process control and improve overall operational efficiency (Liker & Convis, 2017). By integrating the five principles of Gemba—Observe, Recognize, Communicate, Cooperate, and Solve the Problem—into internal fleet management, heavy truck and trailer repair businesses can achieve substantial improvements in both equipment utilization and maintenance workflows.

The Observation principle involves visiting the repair sites to watch real-time equipment handling and identifying inefficiencies in the repair or maintenance process (Modig & Åhlström, 2022). This enables managers and team leaders to uncover issues that affect equipment availability, such as delays caused by missing parts or inefficient tool placement. In addition, the Recognize principle allows fleet managers to detect patterns, such as recurring breakdowns in certain types of equipment or frequent repair delays, which can signify broader operational issues (Womack & Jones, 2021).

Effective communication is another vital component. The Communication principle fosters open discussions between technicians, fleet managers, and support teams about the observed inefficiencies and potential areas of improvement. This aligns with Lean principles of transparency and employee involvement, helping bridge gaps between departments (Liker, 2021). Furthermore, the Cooperate principle emphasizes teamwork across various departments to implement solutions. In repair operations, this often requires collaboration between procurement, maintenance, and management teams to ensure that equipment is repaired efficiently and returned to service as quickly as possible (Gemba Academy, 2021).

Finally, Solving the Problem focuses on not only resolving immediate issues but also developing long-term strategies to prevent similar problems in the future. For example, implementing preventive maintenance programs based on real-time data and direct observations can significantly reduce unplanned downtime and increase overall fleet availability (Womack & Jones, 2021).

Through these principles, Gemba provides a robust framework for continuous improvement, ultimately leading to enhanced equipment availability and operational efficiency in the heavy truck and tank trailer repair business.

Statement of the Problem

Considering the vital roles the internal equipment play in the daily operation of heavy truck and trailer repair, the following gaps were identified:

- There was no records available to track the maintenance history of the equipment. This is because most employees have not been trained to manually gather data to monitor equipment maintenance and performance. This makes it difficult to track maintenance activities on each equipment in the fleet.
- There was no daily equipment inspection sheet for pre-shift inspection because operators have not been trained to do such inspections. Operators used equipment daily without any inspection, however, any usual performance and visible fluid leaks are reported for repairs.
- There was no equipment register which entails the details for each equipment in the fleet for easy identification and parts ordering. Theequipment size in the organization was not known and most of the equipment did not have asset numbers to identify them.

Objectives of the Research

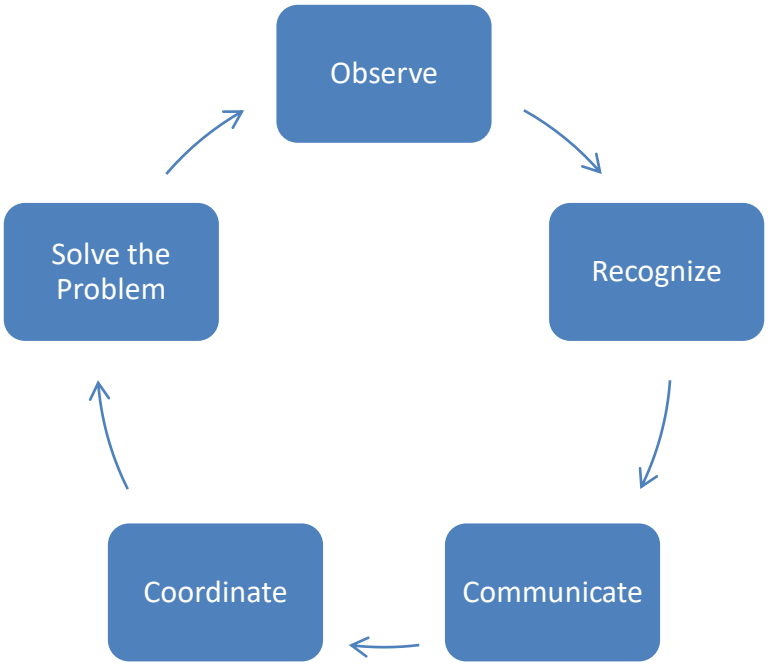
The purpose of this research is to use the Gemba Lean tool:

- To design and implement equipment daily quick inspection sheets.
- To create an assetregister that captures the technical details of each equipment in the fleet.
- Use the equipment utilization sheet to gather data for daily real time equipment performance
- Make recommendations to improve fleet performance by 40 percent.

This research was limited to 7 mobile equipment which represents 28 percent of the selected fleet in heavy truck and trailer repairs.

Literature Review:

The Gemba Process



In the context of heavy truck and tank trailer repair operations, maximizing equipment availability is essential for minimizing downtime and maintaining operational efficiency. The application of Gemba principles—Observe, Recognize, Communicate, Cooperate, and Solvethe Problem—has proven effective in enhancing internal equipment availability. Gemba, a Lean management philosophy, encourages a hands-on approach to problem-solving by observing real-time operations and fostering cross-functional collaboration. This literature review explores the application of the five Gemba principles in improving equipment availability within the heavy truck and tank trailer repair industry.

Observe**:**the first principle of Gemba is to directly observe the work being done to understand the current state and identify inefficiencies. According to Liker (2021). Observing operations in real time allows managers to witness inefficiencies such as delays in repairs, bottlenecks in workflows, or issues with parts availability. This method provides a clear picture of where improvements are necessary. Research by Modig and Åhlström (2022) highlights that on-site observation is a critical component of Lean management, allowing managers to collect accurate data on equipment usage and downtime in fleet operations.

Recognize: after observation, it is essential to recognize the patterns and root causes of inefficiencies. As Modig and Åhlström (2022) point out, recognizing recurring issues, such as frequent breakdowns or poor repair scheduling, can help managers identify areas for improvement. Womack and Jones (2021) further emphasize that recognizing patterns allows managers to focus on key areas that hinder equipment availability, such as inefficient maintenance practices or inadequate preventive measures.

Communicate: effective communication is the cornerstone of successful Lean management. It involves sharing observations and findings with the entire team to facilitate collaboration. Liker (2021) emphasizes that open communication between managers, technicians, and procurement teams ensures that everyone is aware of the current challenges and works together to find solutions. Research by Womack and Jones (2021) indicates that frequent communication between departments, such as between repair teams and parts suppliers, helps to prevent delays caused by lack of information or misaligned priorities.

Cooperate:collaboration across different teams is essential for solving problems and implementing improvements. According to Gemba Academy (2021), cooperation between teams is one of the most important aspects of the Gemba approach. In the context of heavy truck and trailer repair, cooperation between the maintenance team and procurement is crucial for ensuring timely delivery of parts and efficient execution of repairs (Hodge et al., 2020). Without this cross-functional collaboration, equipment downtime may increase due to delayed parts procurement or miscommunication between teams (Modig & Åhlström, 2022).

Solve the Problem: the final principle of Gemba is problem-solving. By addressing the root causes identified through observation and recognition, managers can implement long-term solutions that improve equipment availability. Womack and Jones (2021) argue that solving problems should focus on eliminating the root causes rather than just addressing the symptoms. For example, if delays are caused by poor parts availability, the solution might be to implement a more efficient parts inventory system (Liker, 2021). Additionally, Gemba Academy (2021) emphasizes that solving problems requires continuous monitoring and improvement to ensure that implemented changes are effective over time.

In practical applications, companies that have implemented Gemba principles in their repair operations have seen significant improvements in equipment availability. Research by Hodge et al. (2020) demonstrates that companies in the transportation industry that adopt Lean practices, including Gemba, experience reduced downtime and improved fleet performance. The use of real-time data and direct observation ensures that problems are addressed as they arise, rather than allowing them to escalate and affect overall operations (Modig & Åhlström, 2022). Furthermore, the collaborative approach encouraged by Gemba helps to align teams toward a common goal of maximizing efficiency (Womack & Jones, 2021).

In Conclusion, the application of the five Gemba principles—Observe, Recognize,Communicate, Cooperate, and Solve the Problem—provides a structured framework for improving internal equipment availability in heavy truck and tank trailer repair operations. By directly observing real-time operations, recognizing inefficiencies, fostering communication, encouraging cooperation, and solving underlying issues, companies can enhance their operational efficiency and reduce downtime. The effectiveness of these principles is well-documented in lean management literature and real-world applications across the transportation and logistics sectors.

The Pros versus Cons of using Gemba in Fleet management

The application of Gemba in fleet management can offer several advantages, but it also comes with some challenges. By focusing on direct observation and problem-solving at the operational level, Gemba helps organizations streamline processes and enhance fleet efficiency. However, the approach also has limitations that must be considered.

Pros

Improved operational efficiency through observation: by directly observing the fleet operations on-site, managers can identify inefficiencies that might not be evident from reports alone. According to Liker (2021), observation allows for a clear understanding of real-time issues, such as workflow bottlenecks, inefficient vehicle allocation, or delays caused by equipment failure. In fleet management, this principle ensures that repairs and preventive maintenance are better aligned with actual operational needs, reducing unplanned downtime.

Informed decision-making by recognizing patterns: recognizing inefficiencies or recurring issues, such as frequent breakdowns in certain vehicles, allows fleet managers to focus on high-priority maintenance tasks. Modig and Åhlström (2022) argue that recognizing patterns in equipment performance helps predict future issues, allowing for more effective scheduling of maintenance and repairs, thus improving fleet reliability and longevity.

Enhanced collaboration and communication: the principle of communication fosters transparency between departments, such as repair teams, procurement, and operations. Womack and Jones (2021) highlight that effective communication in Gemba practices improves the flow of information, which is critical in fleet management where parts, equipment, and repair schedules must be well-coordinated to avoid delays.

Faster problem resolution through cooperation: when different departments collaborate to solve problems, as advocated by the cooperate principle, solutions are implemented more quickly and effectively. Hodge et al. (2020) emphasize that cross-functional teamwork in fleet management can lead to quicker responses to repair needs and parts shortages, reducing equipment downtime and improving fleet availability.

Sustainable solutions through problem-solving: the problem-solving principle of Gemba focuses on addressing the root causes of issues rather than just applying temporary fixes. In fleet management, this might mean creating a long-term preventive maintenance plan to avoid repeated equipment failures. Liker (2021) suggests that solving problems at their root leads to sustainable improvements in fleet operations, reducing the likelihood of recurring inefficiencies (Modig, &Åhlström,2022; Hodge et al.,2020). This leads to smoother workflow transitions and fewer delays in equipment availability.

Sustainable problem-solving:the final principle, Solve the Problem, emphasizes addressing the root cause of inefficiencies rather than merely applying temporary fixes. Solving underlying issues related to fleet downtime, such as implementing better data tracking systems for real-time equipment monitoring, provides long-term benefits (França et al., 2017; Womack & Jones, 2021). This ensures sustainable improvements in fleet availability and operational efficiency (Marodin et al., 2016).

Cons

Time-consuming implementation:the Gemba approach, especially the Observe and Recognize phases, can be time-consuming. In fast-paced repair environments, managers may find it difficult to allocate time to physically observe all aspects of fleet operations (Modig & Åhlström, 2022). Additionally, identifying patterns of inefficiency can require weeks or months of consistent observation, which could delay critical decision-making (França et al., 2017).

High initial costs:while Gemba seeks to minimize long-term waste, its initial implementation may involve significant costs. For example, optimizing fleet management may require investment in new data systems for tracking equipment availability or hiring additional staff for closer observation of fleet operations (Hodge et al., 2020; França et al., 2017). Smaller fleetoperations may struggle to justify these upfront costs, even though the long-term benefits could outweigh them.

Over-reliance on human observation: the Observe principle is heavily reliant on human observation, which may lead to subjective conclusions. While real-time observation is beneficial, it can sometimes miss critical data that automated systems could more accurately capture (Gao & Low, 2016; Liker, 2021). Fleet management can benefit from integrating Gemba observations with telematics and other fleet monitoring systems to provide a more comprehensive view of vehicle performance (Marodin et al., 2016).

In conclusion, the Gemba approach, with its emphasis on real-time observation, collaboration, and problem-solving, offers significant benefits for improving fleet management in heavy truck and trailer repair operations. However, the approach is not without challenges, including time constraints, employee resistance, and the potential for high initial costs. Balancing the pros and cons is essential for maximizing the effectiveness of Gemba principles in enhancing fleet availability and operational efficiency.

Challenges in implementing the Gemba Approach fleet management

Implementing the Gemba Approach in fleet management within the heavy truck and tank trailer repair sector offers numerous benefits, including enhanced equipment availability and operational efficiency. However, there are also several significant challenges that businesses may face during implementation. These challenges typically arise from operational complexities, organizational culture, and technical barriers.

Resistance to change: one of the primary challenges of implementing the Gemba approach is employee resistance. Employees, particularly technicians and middle managers, may resist changes to established workflows and processes. The Gemba approach encourages frequent direct observation and interaction on the shop floor, which can

be perceived as intrusive or as micromanagement by the workforce (Liker, 2021). Employees may fear that these observations are intended to find faults, rather than to encourage improvements (Womack & Jones, 2021). Furthermore, implementing changes based on Gemba observations requires a cultural shift, which can take time to become accepted (Modig & Åhlström, 2022).

Time-intensive process: another challenge is the time commitment required for effective Gemba implementation. Gemba involves spending substantial time observing and interacting with the workforce, which can be difficult to balance in the fast-paced environment of fleet management. Heavy truck and tank trailer repair operations often require immediate action to address urgent repairs and maintain vehicle availability, leaving little time for the systematic observation and problem-solving that Gemba demands (França et al., 2017). The approach is more of a long-term strategy, and the need for immediate results in fleet operations may lead managers to bypass the in-depth observation phase (Marodin et al., 2016).

Limited immediate returns: implementing Gemba principles requires patience, as the benefits are often seen in the long term rather than immediately. In fleet management, particularly in heavy truck and tank trailer repair, the demand for rapid solutions and quick returns on investments can make it difficult to sustain long-term initiatives like Gemba (Gao & Low, 2016). Managers may find it challenging to justify spending resources on continuous improvement initiatives when they are expected to meet short-term operational targets.

Data overload and lack of analytical tools: although Gemba encourages real-time observation, modern fleet management systems are increasingly reliant on telematics and data analytics. One challenge is balancing human observation with digital data collection (Liker, 2021). Fleet managers often face the challenge of integrating Gemba insights with telematics data, which can lead to information overload. Without appropriate data analytics tools, it becomes difficult to draw actionable insights from the vast amount of data generated by fleet operations (Gao & Low, 2016). This challenge is compounded when the workforce lacks the training or technical expertise to interpret and act on this data.

Coordination between departments: successful Gemba implementation requires coordination between multiple departments, including procurement, maintenance, and fleet operations. However, in large organizations or those with siloed departments, this cross-functional collaboration can be difficult to achieve (Modig & Åhlström, 2022). For example, delays in spare part procurement can negatively affect fleet repair schedules, leading to prolonged downtime. When departments fail to communicate effectively, Gemba initiatives may be undermined (Marodin et al., 2016).

Cost of implementation: while Gemba aims to reduce waste and improve efficiency, the upfront cost of implementation can be high. Training staff, reconfiguring workflows, and purchasing new equipment can be expensive, especially for smaller companies with limited budgets (França et al., 2017). Additionally, the time and resources required for conducting regular Gemba walks, and monitoring processes can strain operational budgets. Small to medium-sized enterprises (SMEs) may struggle to balance these costs with their operational needs, especially in a sector where margins can be tight (Hodge et al., 2020).

Sustaining continuous improvement: maintaining the momentum for continuous improvement, which is central to Gemba, is another challenge. Often, initial Gemba implementations produce positive results, but over time, the effort to maintain daily Gemba walks, observe processes, and engage in regular problem-solving can fade (Womack & Jones, 2021). This is particularly true in environments where immediate operational pressures overshadow long-term improvement strategies, leading to a return to old habits (Jaca et al., 2016).

In conclusion, while the Gemba Approach can provide significant operational benefits in the heavy truck and tank trailer repair sector, the challenges of resistance to change, time constraints, coordination difficulties, and sustaining long-term improvements must be addressed for successful implementation. These challenges highlight the need for careful planning, adequate resource allocation, and strong leadership to drive and sustain Gemba initiatives.

Methodology and Data Collection:

Research Design

This study used a qualitative research design, employing action research methodology. The researcher participated in the daily operations of a heavy truck and tank trailer facility, observing and documenting equipment usage and

maintenance. This hands-on approach allowed the researcher to identify problems in real time and take part in finding solutions. A field experiment was also conducted, which enabled continuous adjustments as data was gathered and analyzed (Creswell & Creswell, 2018).

Data Collection

Data collection was done through participatory observation, designing data collection templates, and conducting a field experiment. The researcher observed the facility's operations for eight months, identifying issues with equipment maintenance and performance (França et al., 2017). Templates were designed to systematize data collection on equipment usage, maintenance history, and repair needs (Gao & Low, 2016). The field experiment allowed for real-time adjustments to the data collection process, ensuring the findings remained accurate and relevant (Liker, 2021).

Data Analysis

Thematic analysis was used to identify patterns and recurring issues related to the maintenance and usage of the fleet. Data from observation notes, templates, and the asset register were analyzed to find inefficiencies. Quantitative data such as downtime and repair costs were also analyzed using simple statistical methods to identify patterns and potential cost-saving opportunities.

Ethical Considerations

Informed consent was obtained from all participants, and confidentiality was ensured. No personal data was collected, and all findings were shared with the facility management to promote improvements without compromising privacy or safety.

Study Sample

The study focused on seven key pieces of equipment, selected based on their frequency of use and maintenance history over eight months. This sample provided a representative view of the facility's maintenance challenges, ensuring that the research findings addressed both high-usage and high-maintenance equipment.

Results:

Presentation of findings

Item #	Unit #	Model Year	Equipment Make	Model	Serial Number	Department
1	50	2007	Hyster Cont. Tank Handler	H360HD-EC4	G019E01550E	ISO tank Depot
2	42	1994	Yale Forklift	GLP050RFNUAE086	N855042	Parts
3	11	2005	Yale Forklift	GLP060TGEVAE086	A875B34711C	Tank wash
4	55	2013	Bobcat Skid steer	S750	ATDZ12655	Tank wash
5	64	2019	Kalmar Ottawa Yard Truck	T2 4X2	350264	Service
6	89	2003	Kalmar Ottawa Yard Truck	T1 4X2	304575	Tank wash
7	38	2019	Ford F-150 Pick-up	F150	1FTEX1EP4KKD89388	Parts

Fig. 1: Asset Register of the equipment used for this study.

Unit #	Equipment Type	Jan.'24	Feb.'24	Mar.'24	Apr.'24	May '24	Jun.'24	Jul.'24	Aug.'24	Unit total (hours)	Percent %
50	Hyster Cont. Tank Handler	178	148	164	126	114	94	58	199	882	30.3
42	Yale Forklift	7	14	10	11	11	11	6	16	70	2.4
11	Yale Forklift	8	13	11	10	7	10	12	22	71	2.4
55	Bobcat Skid steer	22	4	5	4	11	4	8	24	58	2.0
64	Kalmar Ottawa Yard Truck	128	82	73	39	39	31	39	47	431	14.8
89	Kalmar Yard Ottawa Truck	168	163	193	123	154	88	99	144	988	33.9
38	Ford F-150 Pick-up	44	47	49	54	64	44	49	62	413	14.2
								Total		**2913**	**100.0**

Fig. 2a: Equipment utilization data for the 8 months under review.

Miles Conversion to Engine Hours

The unit of measure for all units were in engine hours except for the Ford F-150 truck which was in miles. In order to make the units of measurement uniform for this research, total distance of 11,352 miles for the Ford F-150 pick-up truck converted into engine hours using the formula **M=EH∗27.5** by making EH the subject, **EH=M/27.5** ((Calculator Academy, n.d.)

- Where M represents miles
- Where EH represents Engine Hours and
- Where 27.5 is the equivalent wear, in miles, an engine would see from idling for one hour. .Applying the above formula, EH=11,352/27.5 =413 hours. Therefore, the equivalent of **11,352miles is 413 hours.**

Fig. 2b: Equipment utilization chart for the 8 months under review.

Analysis of findings

1. From the asset register, it can be determined that:

- Age distribution: the fleet has a mix of old and new equipment. The oldest units are the 1994 Yale Forkliftand the 2003 Kalmar Ottawa Yard truck, which may need frequent maintenance. The newest are the 2019 Ford Pickup and 2019 Kalmar Ottawa which likely requiring less immediate attention.
- Departmental use: the Tank Wash department has some of the older equipment, which could impact operational efficiency. It might benefit from equipment upgrades or additional maintenance.
- Potential areas for action: the older units in the Parts and Tank Wash departments may need replacements or extensive maintenance checks to ensure they continue functioning reliably.

2. From equipment utilization data and chart, the following can be deduced from the Fleet utilization:

- The total fleet hours for the 8-month period from January to August 2024 is 2,913 hours.
- The Kalmar Yard Truck (Unit #89) is the most utilized piece of equipment, contributing 33.9% of the total fleet hours with 988 hours.
- Hyster 360-EC (Unit #50): With 882 hours (30.3%) which is the second-most utilized equipment, with consistent use over the months, though its usage appears to drop significantly in the summer months (June and July) before spiking again in August.
- Kalmar Ottawa Yard Truck (unit # 64) is the third most used equipment with a total hours of 431 hours constituting 14.8% of the total equipment hours.

- Yale Forklifts (Units #42 and #11): These two forklifts have very similar utilization rates, both contributing approximately 2.4% of total fleet hours. Both units show steady, but low, use over the months, peaking slightly in August.
- The least utilized piece of equipment is the Bobcat Skid steer (Unit #55), with only 58 hours of operation, representing just 2.0% of total fleet hours.

Discussion:

Interpretation of results

The results from the asset register and fleet utilization data indicate that better fleet management practices, particularly predictive maintenance, can significantly reduce equipment downtime and improve overall productivity. The data revealed an age disparity within the fleet, with older units requiring more frequent maintenance and newer equipment operating with fewer issues. For instance, older machinery such as the Yale Forklift (1994) and Kalmar Ottawa Yard Truck (2003) may hinder operational efficiency in departments like Tank Wash, where newer equipment could facilitate smoother operations. By identifying heavily utilized machinery, like the Kalmar Yard Truck (#89), the results emphasize the need for targeted maintenance to keep critical equipment operational.

Implications of the Findings

The findings suggest that heavy truck and trailer repair shops should adopt advanced fleet management technologies, such as predictive maintenance systems, to optimize operations and reduce the frequency of unscheduled repairs. Implementing such technologies can lead to more efficient resource allocation and better equipment reliability. The high utilization of specific units, such as the Kalmar Yard Truck (unit #89) and Hyster Container Handler (unit # 50), indicates that these machines play a key role in daily operations, making it essential for repair shops to maintain them regularly. Additionally, underutilized equipment like the Bobcat Skid Steer should be reassessed for its relevance to current operations, and decisions should be made regarding its continued use or repurposing.

Limitations of the Study

One major limitation of this study is the small sample size and its focus on only one repair shop, which may limit the applicability of the findings across the industry. The fleet examined in this case study consisted of only a few units, meaning the insights gained may not fully reflect the challenges or opportunities that other shops with different equipment and operational contexts might face. Additionally, the study's limited time frame may have restricted the ability to observe longer-term trends in equipment performance.

Future Research Directions:

Future research should expand on this study by examining fleet management practices across a larger sample of repair shops. By studying a wider range of equipment, operational settings, and maintenance practices, researchers can validate the findings and identify broader trends in internal fleet management. Additionally, future studies should explore the effectiveness of different fleet management technologies, such as predictive maintenance software, in improving operational efficiency and reducing repair costs across various types of equipment and industries. Expanding the scope of research will help establish best practices for fleet management and maintenance optimization in the repair industry.

Conclusion:

By applying Gemba principles, particularly through direct observation and coordination between teams, the organization can address these inefficiencies. Redistributing tasks to ensure better use of underutilized equipment will prevent overuse of heavily relied-upon units. Additionally, the data suggests a need for predictive maintenance strategies for the most-used equipment, ensuring operational continuity and minimizing unexpected downtime. This holistic approach can enhance fleet efficiency, optimize operational workflows, and extend the lifespan of all equipment across the fleet.

Recommendation:

To ensure long-term solutions that improve fleet efficiency and reduce downtime, the following recommendations are made based on the observed utilization patterns:

1. Establish a predictive maintenance system based on real-time data and historical usage patterns to anticipate maintenance needs of highly utilized equipment such as Kalmar Ottawa yard truck (#89) and Hyster Container Tank Handler (#50).
2. Effective education of team members in all departments on the importance of daily equipment inspection and observe equipment performance during operation to detect defects in early stages (see appendix 1).
3. Invest in telematic systems to monitor real-time equipment performance.
4. Leadership of heavy truck and trailer repair shops should appoint a part-time or a full-time fleet performance expert (depending on their fleet size) to manage their equipment fleet.
5. Adequate budget should be set aside for the maintenance and repairs of all supporting (internal) equipment.
6. Leadership should invest in another Container Handler lift to back up the only existing one to keep the ISO tank depot operations continuous in case the existing one breaks down.
7. Introduce structured scheduling for consistent utilization by:

- Implement a load-balancing schedule that ensures more even distribution of workload across the fleet. Coordinate usage of the Hyster container tank handler and Kalmar Ottawa trucks to avoid peaks and valleys in utilization.
- Ensure that scheduling considers maintenance windows, reducing usage spikes that can cause unexpected breakdowns due to high-intensity operational periods (Liker, 2004).

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