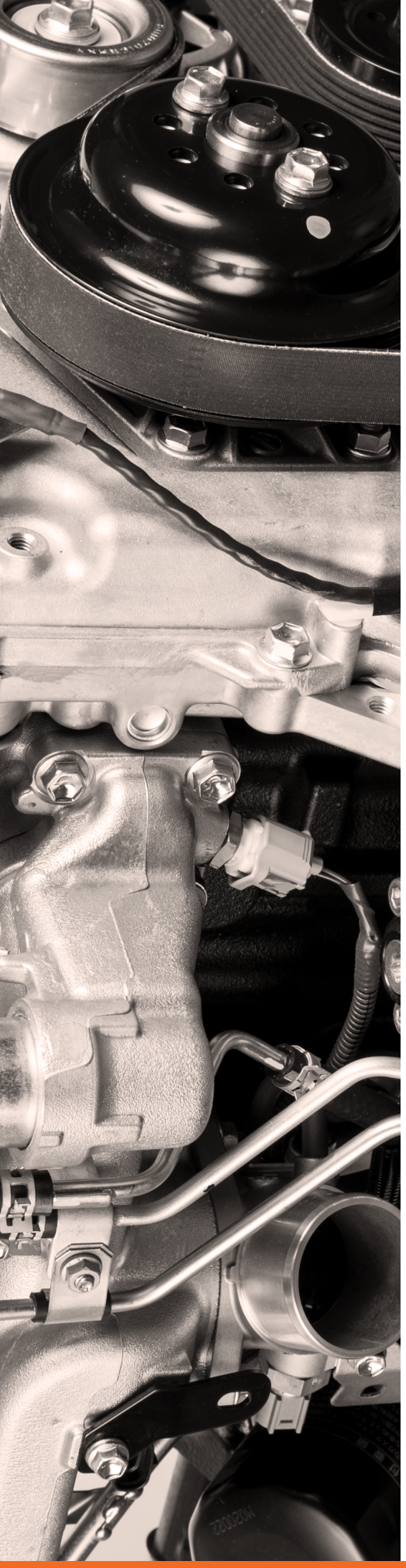
EXPLORING FORKLIFT ENERGY SOLUTIONS FOR MAXIMUM ROI



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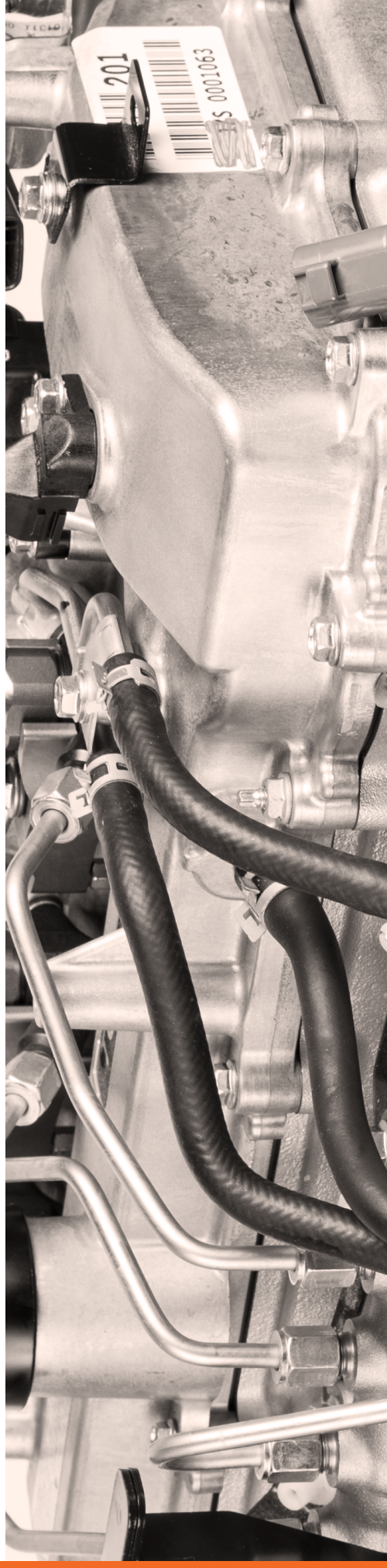
FOREWORD

When evaluating your material handling equipment needs, how can you be sure you are maximizing your return on investment? While you may weigh your options on price and performance, those factors only tell part of the story. And if your goal is making your operation faster and more efficient, you need to know all the facts to deliver peak productivity.

Power is at the center of evolving material handling solutions. In this eBook, we help you understand your material handling energy options, assess your facility readiness for energy change, and make the right energy choice for your operation.



CHAPTER 1

Exploring Battery and Fueling Options

EXPLORING HISTORICAL TRENDS – THE SHIFT FROM IC TO ELECTRIC

The forklift industry has experienced a shift in sales, with electric forklifts now accounting for over two-thirds of the forklift market. Electric forklifts are rising in popularity due to advances in technology that are allowing them to operate more comparably to internal combustion (IC) engine forklifts in regards to performance and run time, with less environmental impact. The emergence of fast-charging capabilities, higher-voltage outputs, and new and improved battery, pump, and motor technologies combine to deliver operational advantages for many applications. In this chapter, we explore various fueling options that, in coordination with a thorough, business-specific operations plan, can drive your business's ROI.

ASSESSING THE ADVANTAGES OF INTERNAL COMBUSTION AND ELECTRIC FORKLIFTS

INTERNAL COMBUSTION

Internal Combustion (IC) forklifts tend to be more popular for outdoor, high-capacity applications and for specialty applications such as paper roll handling and container handling.

Advantages of IC Forklifts:

Versatile
IC forklifts are good indoors and outdoors. They operate well in rain and other inclement weather.

Multi-shift use
Liquid petroleum forklift models, by far the most popular internal combustion option, offer quick tank change capability and relatively low storage space needs.

Lower initial cost
On propane powered forklifts, the investment in propane tanks and their storage area are often the only necessary additional initial costs. Gasoline, diesel, and CNG powered forklifts have similarly low initial costs but are usually purchased when refilling stations already exist in the infrastructure.

Easy to refuel
An operator can easily replace the propane tank and then continue production. Gasoline, diesel, and CNG powered forklifts can also be refueled in a matter of minutes.

Other Factors to Consider: When purchasing an IC forklift, it's important to provide proper warehouse ventilation and also consider noise and the physical requirements of changing a propane tank. Finally, if the operation does not require an IC forklift, you should consider the lifetime costs of maintenance, repairs, and fuel cost when compared to an electric forklift.

Exploring Internal Combustion Options: Liquid Propane, Gasoline, Diesel, and Compressed Natural Gas Forklifts

- Liquid Petroleum Gas (LP) – LP is ideal for customer locations that do not have gasoline, diesel, or CNG refilling stations readily available. If you're purchasing forklifts for a new facility, LP has the lowest initial cost since you only need to purchase LP tanks and find a place to store them.
- Diesel – Diesel fuel is highly efficient and can offer longer run times in general compared to other fuel types, while also providing increased acceleration over their internal combustion counterparts.
- Gasoline – Gasoline powered forklifts are rare due to the popularity of dual fuel units. However, for customers that have refueling stations readily available that can accommodate their fleet size, there is little reason to use LP or dual-fuel configurations. They are also typically more powerful than their diesel alternatives and can provide increased travel and lift/lower speeds.
- Compressed Natural Gas (CNG) – Unlike LP forklifts, the CNG tank is never removed, which can reduce downtime and operator strain. However, infrastructure for CNG refueling stations can be expensive due to the large amount of land required and general cost of equipment and installation, limiting its practicality.

ELECTRIC

Electric forklifts and smaller electric material handling equipment such as electric pallet jacks are commonly used in a wide variety of applications, including warehousing, distribution, food storage, and the cold supply chain.

Advantages of Electric Forklifts:

No exhaust emissions
Electric forklifts are powered by electrical energy sources, which eliminates environmental impact from operational exhaust emissions.

Low discharge maintenance
Electric forklifts use limited disposal waste (e.g. engine and transmission fluid) and a high percentage of battery content can be recycled.

Operator ergonomics
Electric forklifts generate less noise.

Low repair costs
Electric forklifts have fewer moving parts to maintain and repair. AC motor technology eliminates brushes, providing smoother operation and speed control.

Low long-term fuel costs
Batteries for the electric forklift can be recharged. Although there are upfront costs for batteries and chargers, the return on investment over time is also typically high.

Other Factors to Consider: Although electric forklifts have lower lifetime fuel costs, the initial cost is higher than IC models. In addition to the cost of the battery, an area for charging, watering (for lead acid batteries) and cleaning must be arranged. Increased downtime can be a challenge if the battery is not charged or equalized properly.

THE FUTURE OF BATTERY TECHNOLOGY:
LITHIUM-ION AND LEAD ACID COMPARISONS

Lithium-ion forklift batteries provide a wide variety of efficiency advantages that can offer excellent return on investment when managed properly. From consistent power delivery to quicker charging capabilities, lithium-ion forklift battery options offer an alternative to traditional power options. Weighing the ROI of lithium-ion requires considering multiple factors, including the relatively high overall investment cost.

Advantages of Lead-Acid Batteries:

End of life
Because lead-acid batteries have been around for so long, there are many recycling programs in place for them when they reach the end of their lives. The recycling rate on lead-acid batteries is high. Recycling programs for lithium-ion batteries are still being developed.

No transition required
Forklift operators using lead-acid powered forklifts have to change the way they do their jobs when transitioning to lithium-ion because of the need to plug the forklift in to charge every time it is not in use. The transition requires a culture change that usually includes time for a learning curve.

Cost
Lead-acid batteries have low initial costs when compared to lithium-ion options. That means that while there are operational efficiencies that accompany lithium-ion, they are not a solution for every operation. Depending on the size and nature of your specific operation, the high initial costs of lithium-ion may be impractical for your business. Single-shift operations are just one example in which efficiency returns might not outweigh upfront cost.

Advantages of Lithium-Ion Batteries:

Consistent power
Whether you have a single-forklift operation or a large fleet working 24 hours a day, one important factor in delivering results is consistent power throughout the charge of the battery. Lithium-ion forklift batteries deliver consistent power and battery voltage throughout the full charge; lead-acid battery charges deliver declining power rates as the shift wears on (although, Toyota employs power keep functions to help stabilize power rates).

Faster charging speeds
In the context of day-to-day operations, lithium-ion forklift batteries offer significantly faster charging speeds and don't require charging cool down. This can help optimize daily productivity or even reduce the number of forklifts needed to complete objectives.

Opportunity charging
Lithium-ion forklift batteries can be opportunity charged in any setting, eliminating the need for time-consuming battery swaps.

Fewer required batteries
Lithium-ion forklift batteries can remain in equipment longer where one battery can take the place of three lead-acid batteries in a multi-shift use setting. This helps reduce the cost and storage space required for additional lead-acid batteries.

Opportunity charging
Lithium-ion batteries are virtually maintenance free, requiring none of the watering, equalizing, and cleaning needed to maintain lead-acid batteries.

CHAPTER 2

Factors Contributing to Forklift Energy Choice ROI

OVERVIEW: THE ENERGY SOURCE DECISION

Choosing between internal combustion and electric forklift options isn't new. But as innovative, alternative energy options such as lithium-ion batteries evolve, your assessment practices need to evolve with them. There are multiple factors about your specific operation that can help you decide which energy option is the right choice.

Exploring Fleet Size

Fleet size can be one of the most important factors when deciding on an energy solution. The size of your fleet reveals a great deal about your operation's needs in terms of cost, speed of fueling transition, and storage.

Small fleet operations with 1-2 forklifts have to weigh the higher, overall comparative initial cost of electric against savings in lifetime fuel efficiency. It can be cheaper to run a lead-acid battery-powered forklift than an internal combustion counterpart over their respective lifetimes.

Large fleet operations have to consider whether the cost savings associated with electric remain high when faced with the need to buy additional lead-acid batteries. That need can lead to increased battery investment, storage space requirements, and maintenance time for watering and swapping. In the long run, these costs can eat into overall efficiency savings, and internal combustion – or a transition to lithium-ion – might be better options.

The impact of lithium-ion batteries on the fleet size factor? They don't require maintenance, meaning that your downtime and labor costs are reduced significantly when compared to lead-acid batteries. But, they are also more expensive than lead-acid batteries, meaning they'll alter the outcome of your ROI analysis.

It can be difficult to gain a full picture of your needs by only considering fleet size... it's only one of the most important factors that have to do with efficiency. The others are utilization (number of shifts) and productivity/throughput increase.

PRO-TIP

For more information on lead-acid battery watering, visit ToyotaForklift.com/battery-watering

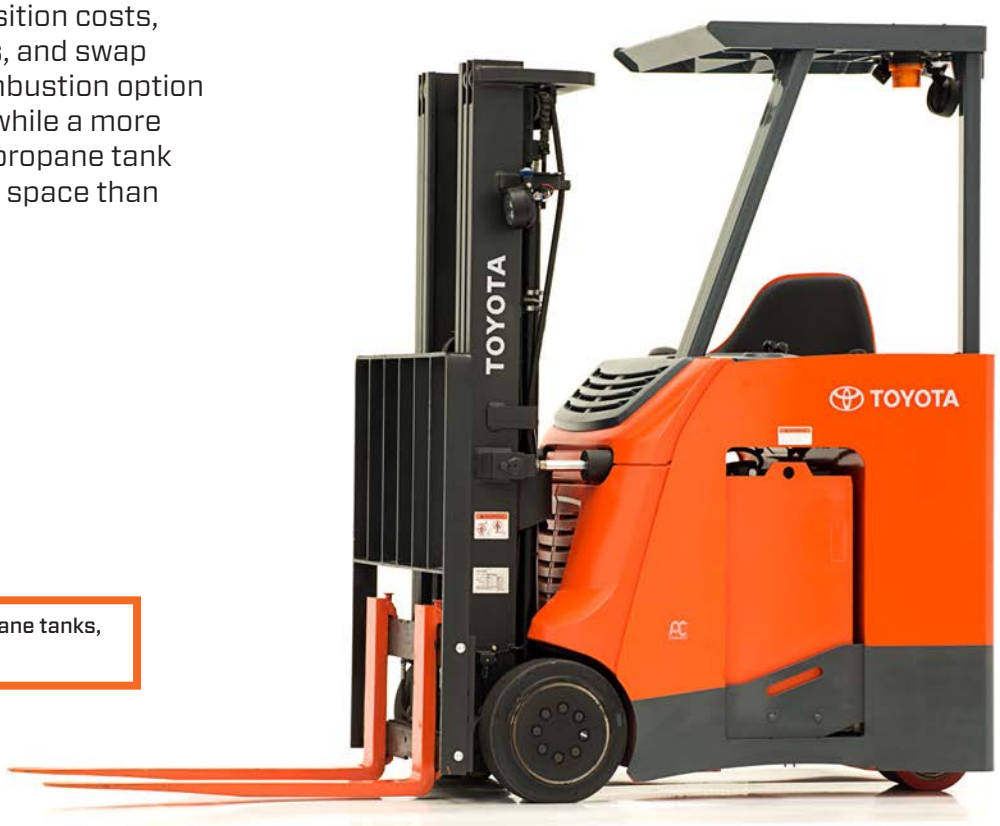
EXPLORING SHIFT CYCLES

The number of shifts forklifts run during a normal day of operation will have a profound impact on your energy decision. Combined with fleet size, these two elements are foundational when assessing your options.

Single-Shift Operations might seriously consider electric forklifts as a good option. Single-shift operations can take full advantage of energy efficiency savings because they can allow the forklift to sit and the battery to charge while the facility is closed. Operations with a single shift, however, may take longer to achieve full return on investment with electric forklifts due to lower utilization – a key factor in determining operation and labor cost.

Multi-Shift Operations and Continuous-Shift Operations have to consider several variables when weighing lead-acid battery and internal combustion options. The efficiency savings of lead-acid batteries are reduced the most in these operations because they are faced with needing to buy battery exchanging equipment and additional batteries – typically one for each shift. This translates to increased acquisition costs, storage space, maintenance areas, and swap times. In that case, an internal combustion option deserves serious consideration – while a more expensive fuel option, replacing a propane tank is quicker and requires less facility space than swapping and charging a battery.

What is the impact of lithium-ion batteries when considering number of shifts? Lithium-ion batteries offer considerably faster charge speeds, and they can stay in the truck for multiple shifts while being opportunity charged during breaks. This means that they deliver a significant operational advantage over their lead-acid counterparts and can be considered a suitable electric option to replace propane in multi-shift operations. However, because lithium-ion can cost up to 3x more than lead-acid, they might not be right for every operation.



PRO-TIP

For more information about exchanging propane tanks, visit ToyotaForklift.com/propane-tips

EXPLORING ENVIRONMENTAL FACTORS

The term “environmental factors” is a wide-reaching term that can cover a wide variety of considerations, from your facility layout and industry requirements to the actual temperature of the areas where your forklifts operate. Consider each of these factors when you’re weighing your energy options.

INDOOR VS. OUTDOOR

Traditional wisdom dictates that outdoor operations use internal combustion forklifts. But with new pneumatic electric options on the market, outdoor applications for electric forklifts can be considered.

UL-CERTIFICATION

Underwriter’s Laboratory (UL) provides guidelines for the use of equipment in certain industries and applications. Your application may require a certain specific UL certification (see sidebar).

TEMPERATURE

Cold-storage operations often run electric forklifts with built-in component insulation. But don’t neglect to consider the ambient temperature change when moving room to room. Of note? Lithium-ion batteries run longer and operate at a higher voltage than lead-acid batteries in cold temperatures, leading to performance advantages. Lithium-ion batteries can also be manufactured with a heater, allowing the battery to stay warm while operating in a cold environment while also functioning at full capacity in ambient temperatures.

FACILITY SPACE

Forklift batteries require space for storage, charging, and maintenance. Your existing facility layout and available space can influence your fuel choice.

Selecting the Right Technology Partner

When it comes to selecting the right forklift energy partner, not all companies are equal. Toyota Industrial Energy Solutions aims to stay ahead of the energy curve. Working within the Toyota Production System, the energy arm of Toyota Material Handling draws on years of research and insight to deliver you the energy resources you can trust.

As the first to market with a UL-E and UL-EE approved sit-down forklift and lithium-ion battery combination, Toyota Industrial Energy Solutions is working within industry guidelines to deliver the latest energy options. With an approved alternative energy source for every electric forklift in our lineup, you can take advantage of energy innovation, no matter the application.

Toyota is the right energy partner to power you toward success. To learn more visit: ToyotaForklift.com/energy-solutions

CHAPTER 3

Performing a Facility Energy Audit Focused on ROI

WHAT IS A FACILITY ENERGY AUDIT?

A facility energy audit is an opportunity to have an experienced, trusted representative from your local material handling solutions provider come to your facility and look for opportunities where you may be able to increase efficiency and lower operational costs based on the use of forklift power options and facility power layouts (i.e. storage locations, charging locations, etc.).

Most importantly: They'll recommend practical solutions tailored to your specific application and the way your business operates.

Often, these solutions are low-cost, such as process improvements or rotating your existing fleet. Investing in new charging systems, batteries, or other equipment may also be recommended — either now, or in the future when it's time to replace existing equipment (allowing you to plan ahead for the changes and incorporate them into your budget in advance).

By implementing the recommended solutions, you may realize a return on investment in a variety of areas, such as:

- Energy saved
- Cost of equipment purchased
- Throughput increased
- Storage or charging space saved (which can now be used for income-producing activities)
- Operator productivity, comfort, and satisfaction increased.

THE AREAS EVALUATED DURING AN ENERGY AUDIT AND THEIR ROI IMPACTS

Charging Stations: Ideally with the assistance of an electrician or facilities manager, auditors will examine your current battery charging station to identify the incoming line voltage, number and types of chargers used, space taken up, and location of the charging station in relation to other operations and spaces.

ROI: Forklifts keep your business running, and charging stations keep your electric forklifts running. The audit will help you use these areas as efficiently as possible, enabling you to maximize every minute of every shift. Some of the cost-saving considerations might be whether moving a break area closer to the charging stations would encourage operators to opportunity or fast charge, whether additional chargers (or different types of chargers) are needed, or if a more efficient charging schedule with your existing chargers will help keep things moving.

Battery Storage: Your current battery storage facilities and practices will also be evaluated. How many batteries are you storing, how are they being stored, how many trucks are they supporting, and how much of your facility's space is being taken up by batteries are some of the questions auditors will take into consideration.

ROI: Space is often at a premium, especially in warehouses and distribution centers. For those applications needing to store additional lead-acid batteries for swap outs to keep their equipment moving, this audit can help make sure the batteries are stored with as small a footprint as possible. This process can also help companies determine whether alternative energy solutions — such as lithium-ion batteries — would be worth the investment in order to recoup the storage space for income-producing activity.

Forklift Specifications: The auditor will assess your forklift fleet for size (number of trucks and capacity of trucks), age, technology mix, and usage. A piece of data-logging equipment may also be installed on one or more of the trucks in your facility for approximately a week to gather data on real energy use.

ROI: With a practical understanding of how you're using the equipment you already have, you may find opportunities to help you get more out of those machines by rotating them through your operation more efficiently. You may also realize that a different type of equipment – be it electric forklifts instead of IC or lithium-ion batteries instead of lead-acid — would be a better fit for your application's energy requirements. You may even find that your trucks aren't being used as efficiently as you thought, and your fleet size can be reduced.

IC Fueling Stations: Auditors will examine IC fueling stations from a variety of angles. They may consider how many trucks the stations are servicing, how much fuel is being consumed, how frequently trucks need to be refueled, and station locations in relation to other key areas and operational spaces.

ROI: Similar to the inspection of charging stations for electric trucks, the name of the game here is eliminating wasted downtime and maximizing productivity. Making sure that fueling locations and scheduling are convenient to operators in the flow of their work and natural breaking points, such as shift changes, can add up to a major impact on your operation's efficiency and ROI.

Application: Auditors will observe current equipment in action to identify key performance needs. The list is long, but a few examples of critical aspects of your operation to examine include: How many shifts do you run? How high does your equipment need to lift? How intense is your duty cycle? What maximum load weight are you carrying? What's your break schedule for opportunity charging? Do you have UL requirements? Are there other special requirements – such as connector type, connector color, spacers, or tray adders – that you need?

ROI: One of the most important factors in getting your equipment is looking at how you'll be using them. This process helps to ensure that your purchase decisions not only meet the basic need of getting the job done, but optimize your fleet for efficiency and productivity in the unique way your business runs.

Maintenance Areas: Battery swapping, watering stations, and other maintenance activities will all be observed and evaluated. Not only will auditors consider the types of watering systems and other equipment, but also the space and layout allocated for maintenance and the tools and accessories available to operators and techs to perform those tasks.

ROI: You'll receive suggested solutions to help maximize efficiency, improve workflow, and make conducting maintenance easier. For example, single-point watering systems may be suggested to improve maintenance on flooded lead-acid batteries. If operators are having difficulty disconnecting the batteries, adding a handle to the battery connector might be a time-saving option to consider.

Facility Power Considerations: Not only will the auditors look at your usage capacity (the maximum amount of power your facility is able to provide to your equipment), but also the types of electrical systems your facility already runs, your current overall throughput (the amps consumed daily), and — if different — your throughput during your peak season.

ROI: With these insights, you'll be able to make sure that your facility is capable of providing the power your equipment needs — both in your typical day-to-day operations and in those seasons when you're running fastest and working hardest.

CHAPTER 4

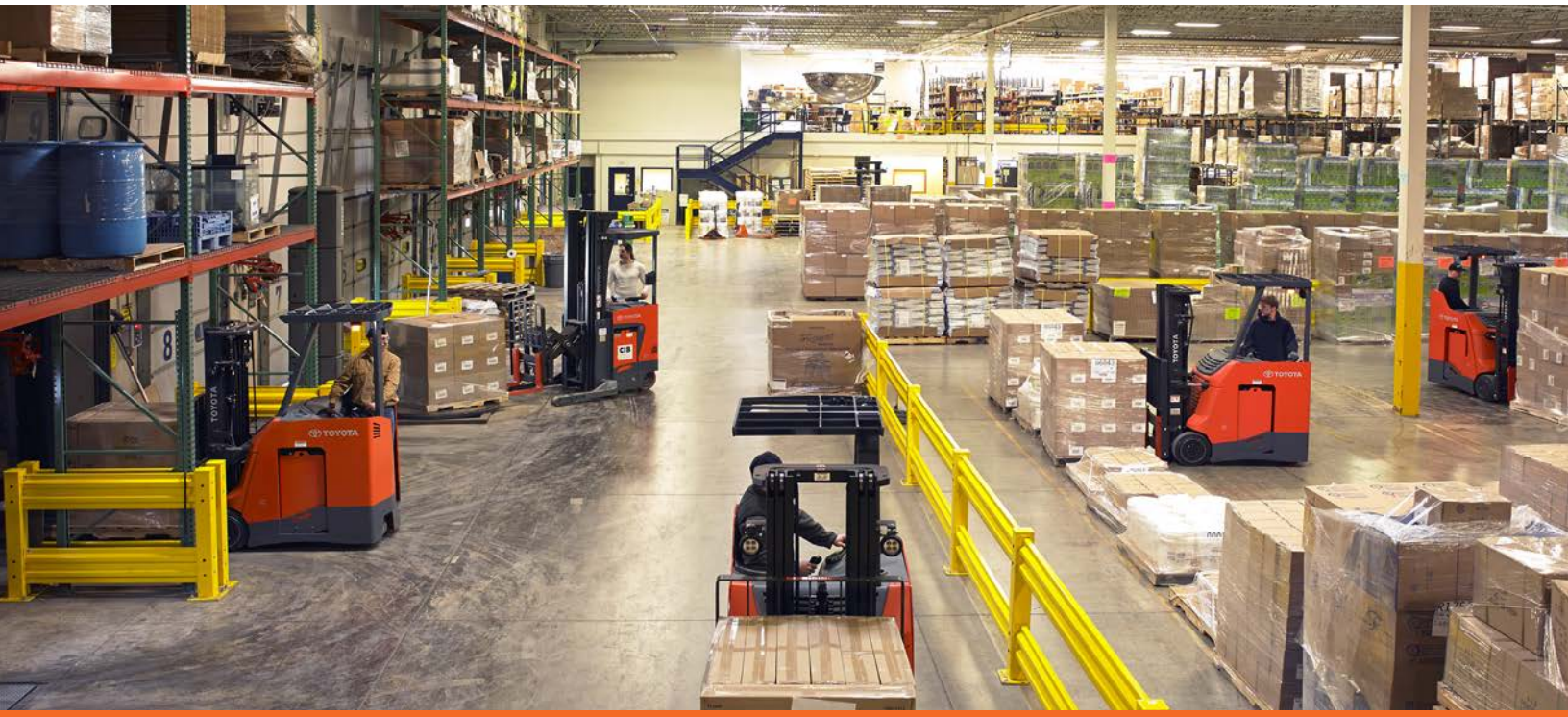
Assessing Your Forklift Charging Station to Maximize ROI

In today's fast-paced environments, forklift charging stations should help optimize your fleet's output, which in turn can help increase production in your warehouse. While easy to neglect, having your equipment in the right area and using the right technology can have a major impact. The location of the charging station, different charging methods, and charging stations for larger fleets can be optimized to have positive effects on the business.

ASSESSING LOCATION IN FACILITY LAYOUT

Location, location, location. When it comes to your battery charging station, location can have a large impact on efficiency. Just because your warehouse has a large open space which seems to be the perfect size for a charging station, you may want to take additional considerations into account:

- Keep in mind where your forklift drivers start/end their day. Are you making them walk to the other end of the facility to find their forklift? Making sure the drivers have easy access is an excellent place to start maximizing operator productivity.
- Make sure you have enough room for your forklift fleet. You need to have adequate room for your trucks to charge, the charging stations, battery storage, as well as any traffic that goes on around the area. To help reduce the amount of room your racks take up, you may want to choose a location with a higher ceiling. Storing batteries on a vertical racking unit can help you save space.
- Keep in mind that your warehouse will expand as your business grows. Make sure the charging station is in a location that would work well in the infrastructure of a larger space.



ASSESSING CHARGING METHODS

Depending on what type of operation you run, as well as how many shifts your trucks are working, you may utilize different charging methods. The three most common types of charging methods are conventional, fast, and opportunity:

Conventional

Conventional charging works best for companies that are running a one-shift operation. This means that you run the forklift for part of the day, put it on its charger when you are finished, and resume activity the next day when the truck is fully charged. The downside to this charging method is that adding shifts requires additional batteries for each forklift. Once the first shift is finished, you will need to have a driver/staff take out the battery and replace it with the new one before the next shift can start. This will decrease the amount of time operators are driving the forklift and subsequently decrease your productivity.

Fast

Using the fast charging method, you can partially charge your forklift's battery in a matter of 10-20 minutes, usually during breaks or between shifts. One benefit of this method is that you do not need a great deal of space for extra battery storage – you are using the same battery and charging more frequently. The downside to fast charging is that it is extremely hard on the battery, impacting the battery warranty, and giving the battery a shorter life. The fast charging method is best used by continuous-use operations since they need to keep forklifts moving as frequently as possible. The less time it takes to charge, the more time the forklift can be in operation. Note that fast charge operations need one night per week to fully charge the trucks and equalize the battery. This is typically completed over the weekend.

Opportunity Charging

Opportunity charging is similar to fast charging, but isn't best suited for more than two shifts per day. Like fast charging, opportunity charging takes advantage of breaks and shift changes to charge the forklift. The biggest difference between opportunity and fast charging is the start rate of the chargers. The start rate of opportunity charging is between 21-30 amps per 100 AH, while fast charging is 31-60 amps per 100 AH. Opportunity charging will also require different chargers than conventional or fast methods. If you use a conventional or fast charger, attempting to opportunity charge may damage the battery and decrease its life.

Assessing Location of PPE and Safety Materials

Alternative forklift batteries have varying safety considerations. When choosing a location for your battery charging station, make sure it is located near an area with water supply, since proper safety protocols require an eyewash station and showers, as well as spill kits needed in the event battery acid leaks. Be sure to prepare a station where your operators and technicians have access to aprons and gloves, face shields, and protective eye equipment. These steps will help facilitate best safety practices associated battery maintenance and swapping. You will also need to have the battery charging station in a well-ventilated area of the warehouse to prevent a buildup of gases associated with battery maintenance.

Remember that different types of batteries, such as LiB and lead-acid, will have varying needs. Consult with your battery provider to take the appropriate precautions.

PRO-TIP

It can be difficult to decide where to assess the best charging station and station placement for your operation. Toyota forklift dealers are standing by to help by providing a site survey audit. Dealership personnel can help assess your operation, and provide valuable input on your facility needs. To find your local Toyota dealer visit ToyotaForklift.com/find-a-dealer

CHAPTER 5

Equipment Focus: Assessing Your Battery Technology for Maximum ROI

UNDERSTANDING THE IMPACT OF ENERGY TRANSITION

Utilizing the correct energy sources to power your fleet plays a significant role in optimizing your operation. With a proper assessment and a well-prepared strategy, transitioning to a new energy source can lead to significant return on investment (ROI).

This change affects more than just your bottom line. Employees, customers, and suppliers all stand to benefit from positive change, whether it be in the form of increased efficiency and throughput or reduced downtime. Determining the best energy source begins with an assessment of your current equipment and needs. This allows you to establish a baseline with which to judge all other options and understand overall impact.

ASSESSING CURRENT ENERGY TECHNOLOGY

Current energy technologies fit into two primary categories – electric and internal combustion (IC). When assessing your current technology and comparing to an alternative, there are a wide variety of factors to consider. Here are a few to keep top-of-mind during the assessment process:

Acquisition costs

Assessing the initial, up-front cost of the forklift and all necessary equipment is a good starting point for understanding ROI. This includes the forklift, batteries, chargers, storage areas, and any other equipment required to operate and maintain your fleet.

Operating costs

Consider all associated costs for operating and maintaining your forklifts and equipment. This includes fueling, energy used for charging, daily and periodic maintenance and repair, labor costs, downtime, and differences in throughput.

Resale Value

For operations that purchase equipment instead of leasing or renting, consider the value you can obtain from selling it at the end of its useful life. Some forklifts hold better value based on market demand and rate of depreciation based on wear and tear.

GENERAL CONSIDERATIONS:

- Electric forklifts typically have higher acquisition costs than IC forklifts due to requiring the purchase of one or multiple batteries and chargers.
- Electric forklifts tend to have lower operating costs due to less required maintenance and downtime as well as the cost of electricity typically being lower than the cost of fuel.
- IC forklifts generally tout higher performance for improved throughput. Electric forklifts with 80V electrical systems can provide comparable performance at an increased acquisition cost.
- LP forklifts typically have lower operating costs compared to gas and diesel thanks to reduced downtime for fueling, no fueling station requirement, and flexibility with LP tank storage locations.
- Resale value varies by make and model of forklift, condition, and supply and demand for that type of forklift.

ASSESSING TRADITIONAL VS. NEW BATTERY TECHNOLOGY

The energy sources that power electric forklifts play a significant role in overall return on investment. Traditional lead-acid batteries have been a staple of the industry for years thanks to lower acquisition costs and general familiarity with the technology. New technologies, including thin-plate pure lead (TPPL) and lithium-ion batteries (LiB), however, have seen rapid increases in adoption as ROI becomes easier to realize.

The biggest deterrent of adopting new battery technology is the acquisition cost. In many cases, this acquisition cost may be offset by significantly reduced labor and maintenance costs. Lithium-ion batteries require no maintenance and they can allow a forklift to operate over multiple shifts without swapping the battery due to faster charging rates and opportunity charging. This reduction in downtime can really add up over the lifetime of your equipment.

Lead-acid batteries, on the other hand, require multiple batteries to support multi-shift operations as they require a 16-hour period for charging and resting before being used again. A battery storage and swapping area as well as equipment to support these operations also needs to be purchased and maintained.

To assess the appropriate technology for your business, you will need to perform a thorough cost-analysis based on all of these factors. Be sure to take into account your application's details, including fleet size, distance between charging stations and break rooms, number of shifts, and labor rates, just to name a few.

ASSESSING CHARGER NEEDS

Determining the correct charger starts with understanding the requirements and capabilities of your batteries and facility's power grid. At a basic level, you will want to ensure the connector type, voltage, amp-hour rating, and cell chemistry of your batteries are compatible with the chargers you select. Your facility's power grid will also need to support the proposed charging configuration by being able to handle your business' current draw during peak season. Work with an electrical professional to perform this test and to determine if the phase of the incoming voltage line is appropriate for the proposed chargers.

Next, review the different types of chargers and their capabilities to find one that fits your needs. Consider the factors below when determining the appropriate charger for your application. Minimizing downtime and maximizing efficiency will help provide optimal results and improved ROI.

CHARGER CONSIDERATIONS:

- **Frequency** - Higher frequencies increase charge rates and can allow for opportunity and fast charging.
- **Energy Efficiency** - Converting power from the facility grid more efficiently can have a positive impact on your electric bill.
- **Multi-Voltage** - Being able to charge multiple battery voltages using one charger can reduce the total number of chargers needed.
- **Smart Functionality** - Features such as wireless communication and programming allow for expert control of charging efficiency and timing.
- **Size & Weight** - Small, lightweight chargers take up less footprint and can be handled and transported more easily.

ASSESSING CURRENT MATERIAL HANDLING PARTNERSHIPS

Assessing, determining, and correctly implementing a successful energy adoption strategy can be a daunting task. It requires advanced technical knowledge, significant resource investment, and a thorough understanding of your application and optimization goals. When performing this type of analysis, it is best to rely on professionals that can use their wealth of knowledge and resources to guide you on your path to success.

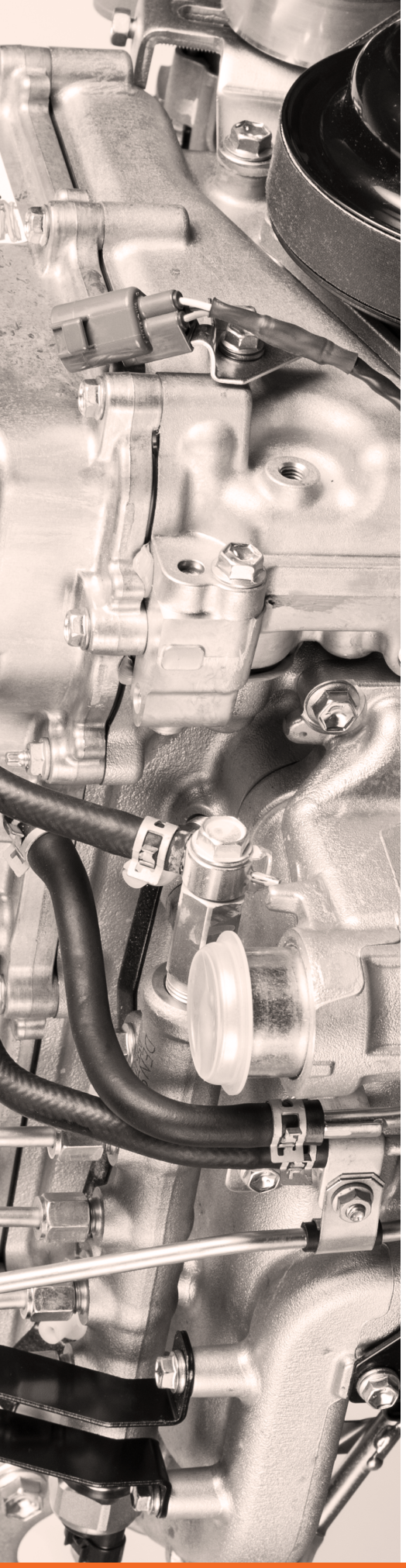
When assessing your current material handling partnerships, ask yourself these key questions:

1. Do they work to thoroughly understand my needs before attempting to sell equipment?
2. Is their product and solutions portfolio robust and technologically advanced enough to handle my evolving needs?
3. Do they possess the expertise necessary to perform thorough ROI evaluations and confidently offer the correct solutions?
4. Does the quality and performance of their solutions live up to our expectations?
5. Am I getting the appropriate level of service and support to keep my business running smoothly?

If you answered “no” to any of those questions, or if you currently don’t have a material handling partner, you should consider evaluating a new solutions provider. During the evaluation process, use these questions to identify ideal partners that will best support you and your growing business.

PRO-TIP

When assessing your facility’s energy needs, you are not alone. Your local, authorized Toyota dealer offers free on-site consultation and can perform energy studies to pinpoint efficiencies in your operation. Toyota dealers are uniquely positioned to optimize your operation with the latest technological innovations that are tested and approved by Toyota. To learn more visit ToyotaForklift.com/energy-solutions

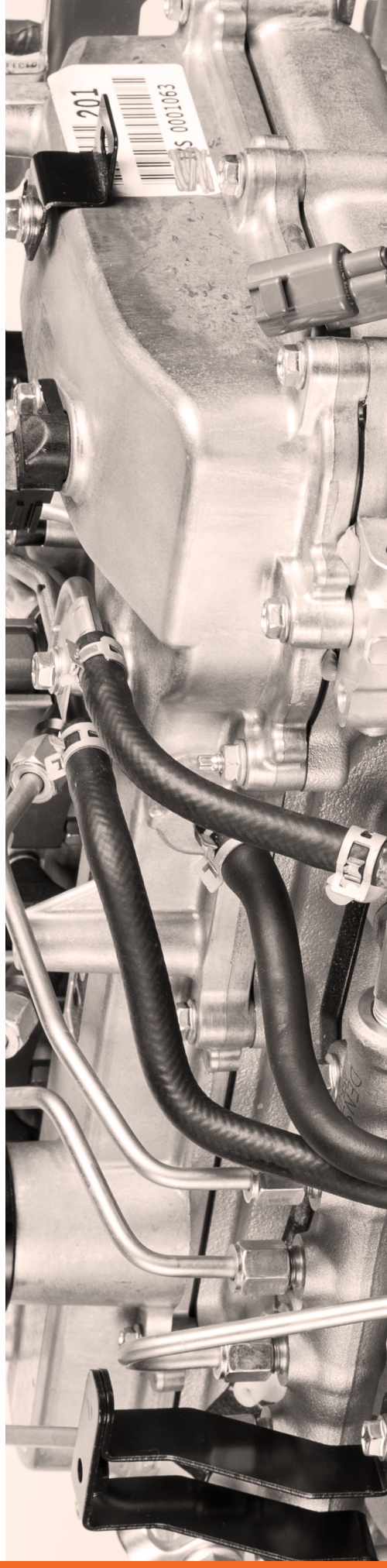


CONCLUSION

GENCHI GENBUTSU

“Genchi Genbutsu” is a Japanese term meaning “go and see” and it plays a vital role in the Toyota Production System. Instead of trying to resolve the issue from afar, it is critical to witness the activity first-hand to have a thorough understanding of the situation. This allows you to implement proper countermeasures earlier and improve overall quality.

While the term is often used in manufacturing, it can apply to almost any situation, including optimization and implementing change in any business. Before implementing a forklift energy solution, you must first evaluate the entire operation in-person and speak to the people who are performing the work on the front lines. Whether this means walking the floor to assess refueling and charging stations or speaking with operators about their battery or fuel challenges, successful assessment will only come after you “go and see” the current state of the operation for yourself. After the evaluation is complete and a solution is reached, establish a new standard of work. Practicing genchi genbutsu will set you up for success as you take your next step in forklift energy evolution.



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