



**TRIATHLON**<sup>®</sup>  
GROUP

## Selling Lithium Systems



# Agenda

- 1** **Triathlon At A Glance**
- 2** **The Evolution Of Lithium In Motive Power**
- 3** **The 4 Question Approach to Selling Lithium Systems**
  - A** **WHAT Is A Lithium System?**
  - B** **WHEN Should You Sell Lithium Systems?**
  - C** **WHY Should I Buy Lithium Systems?**
  - D** **HOW Do I sell Lithium In A Price Sensitive Market?**
- 4** **The Aftermarket Approach to Servicing Lithium Systems**



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# Triathlon Holding GmbH

- 75 years of experience
- Strong commitment to provide premium customer service and TCO solutions
- Focused strategy on new product development, systems and service
- Financial strength to fund future business development


 **5**  
Ultramodern Battery  
Production Facilities  
in Germany

 **10**  
Regional Sales  
& Service Facilities  
in Germany


 **> 1,300**  
Employees  
Worldwide

 **~2,500**  
Traction Batteries  
per Week

 **8** Specialized  
Facilities

**3**  Production Facilities  
for Battery Components

 **Advanced  
Lithium Ion  
Battery  
Systems and  
Solutions**

 **Certified  
DIN EN ISO  
9001, 14001,  
45001**

**Over 100,000  
Lithium  
Systems Sold  
Globally**

**\$ 640 Mio.  
Sales\***  
\*2021

 **4** International  
Facilities  
**5** International Partners

## Triathlon Battery Solutions, Inc.

- Headquartered in Dallas, Texas
- 87K square foot facility
  - Offices, warehousing, battery assembly, rental battery fleet and used battery refurbishment, local and remote service operations
  - Over 4,500 Pallet locations
  - 80 + Employees
- Triathlon<sup>®</sup> Lithium-Ion Battery Systems and chargers
- Triathlon<sup>®</sup> Tubular Flex US, DIN and BS Lead-Acid batteries
- TriCOM<sup>®</sup> HF Chargers
- Ancillary battery/charger products



## TRIATHLON Sustainability Policy

### Resource-efficient production

e.g.

- holistic recycling concept
- extensive use of renewables

### Product development that support best lifecycle management and technology leadership

e.g.

- 2<sup>nd</sup> and 3<sup>rd</sup> life concepts developed and implemented
- R&D goal: laying the foundation for further technological developments



### High transparency in supply chains

e.g.

- strict monitoring of suppliers
- inhouse mapped value chain steps as a benchmark

### Sustainable customer relationships

e.g.

- absolute customer-centered thinking and acting in the TRIATHLON DNA
- partnerships sought for the mutual benefit of all

### Motivating employees

e.g.

- family corporate culture
- individual support for each employee welcome

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## The Evolution of Lithium In Motive Power

### Early Stage

### Middle Stage

### Present/Future

- Perceived Safety Risk
  - Boeing 777, Samsung Note, Hoverboards
- Unproven Interest – Skepticism
  - Early adopters only
- Large Battery Manufacturers discounting validity of Lithium
  - Consumer good only
  - Class III only
- No OEM Integration
  - Phase 1 – Lead out/Lithium in
- Lithium Batteries vs Lithium Systems
  - Charger sold separately
- Price (4-5 times the cost of lead)
- Ah vs kWh not understood
  - Need a bigger battery
- No standardization
  - UL, OSHA, Lithium mining
- No recycling/disposal, No secondary markets

- Safety Concerns have greatly abated
- Proven Acceptance
  - National Accounts converting entire warehouses to Lithium
    - Amazon, BMW, Menards, Goodyear, DHL
- Large Battery Manufacturers playing catch-up
- OEM Integration
  - Phase 2 – Discharge Indicator and safety shut down integration
- Lithium “Systems” are now mostly required
  - Battery and Charger
- Price (2.5-3.5 times the cost of lead)
  - Manufacturing scalability improving
- Ah vs kWh becoming understood
- Standardization
  - UL, OSHA, Lithium mining
- Recycling/disposal, secondary markets

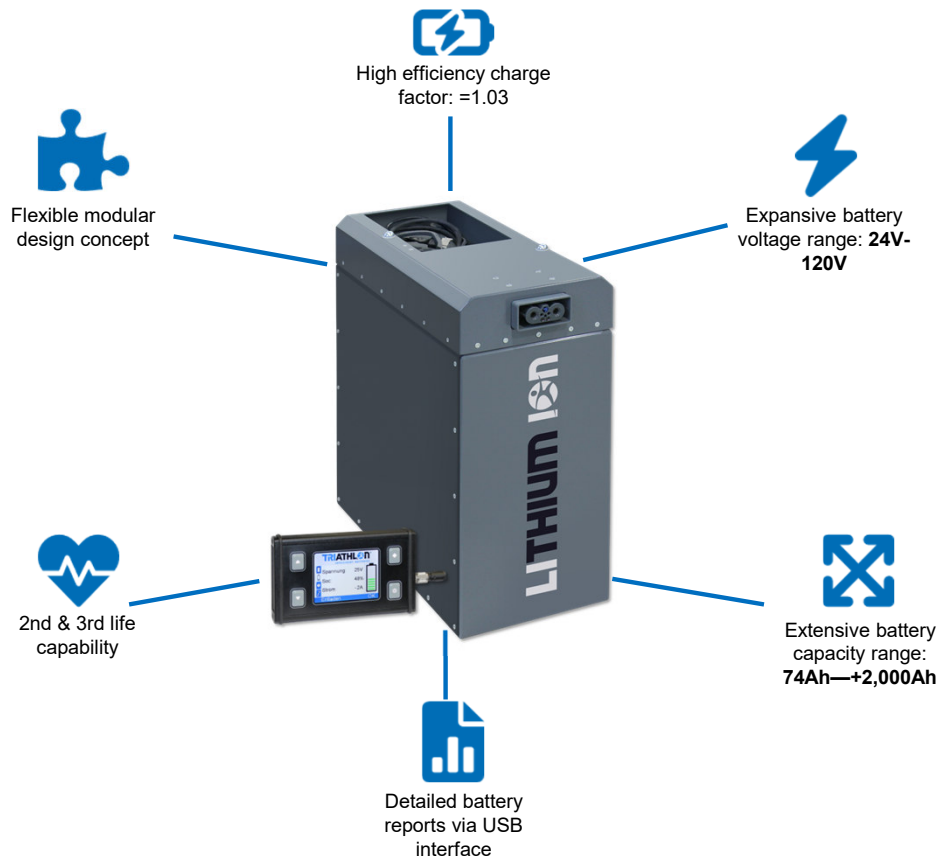
- Lead Acid is viewed as unsafe?
- Mainstream Adoption
  - Large and small users
- OEM Integration
  - Phase 3 – OEM’s designing Lift Trucks without traditional large battery compartments
  - Class 3 only in Lithium
  - Connectivity – Information through the truck systems
- Price (2-3 times the cost of lead)
  - Manufacturing scalability achieved
- Standardization Achieved
  - UL, OSHA, Lithium mining
- Recycling/disposal clearly defined
  - Secondary markets available

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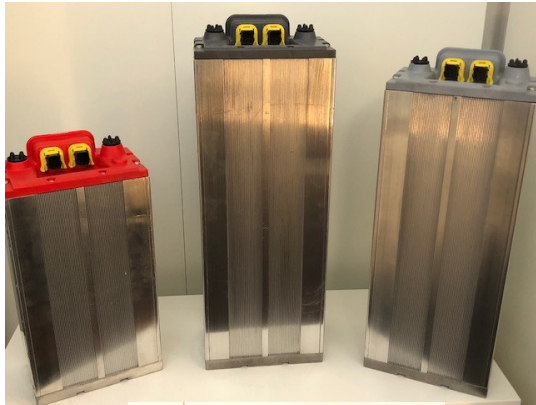
## Triathlon Lithium-Ion Battery



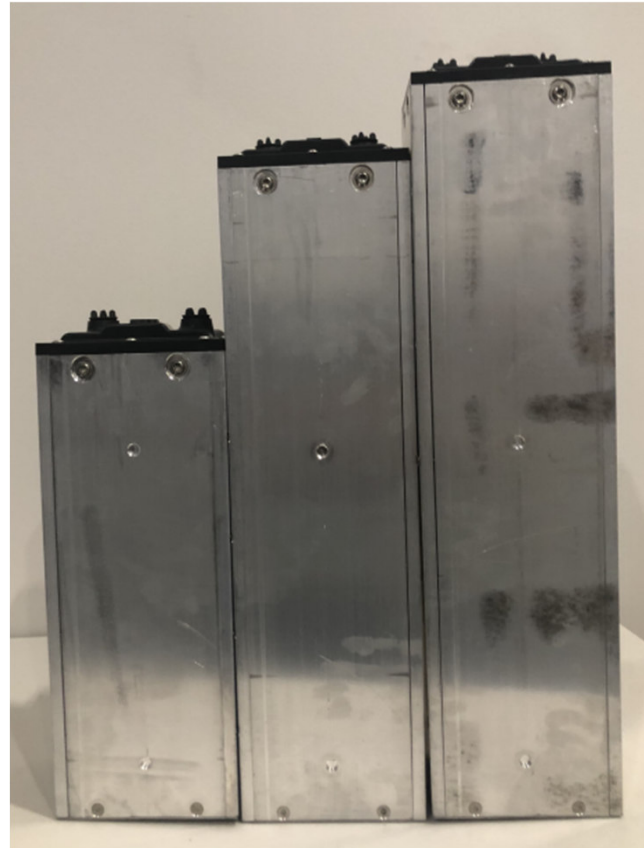
- ✦ **Designed to meet rigorous demands of the motive power industry**
  - ✦ **Robust external design**
  - ✦ **Agile internal modular concept**
  - ✦ **High efficiency charge factor**
  - ✦ **Extensive range of voltage and amp hour capacity**
  - ✦ **Intuitive battery diagnostic reports for service personnel and customer**
  
- ✦ **Suitable for medium to heavy load, multi-shift operations, ranging from freezer to warm environments**

## Triathlon Lithium-Ion Systems - Gen1 to Gen2

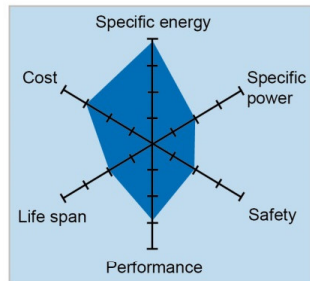
- 52 AH Gen 1 Modules



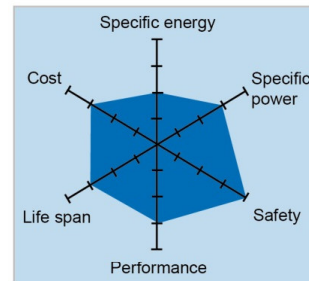
- 74 AH Gen 2 Modules



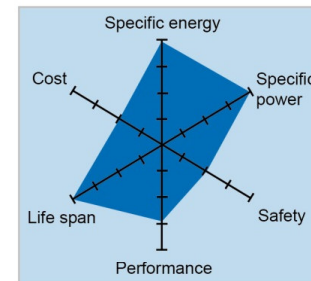
## Various Lithium-Ion Chemistries



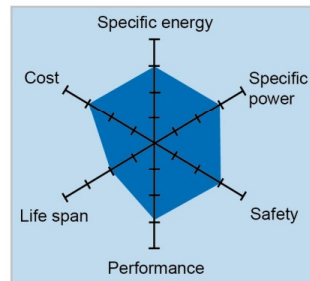
**Lithium Cobalt Oxide**  
Li-cobalt  
(LiCoO<sub>2</sub>)



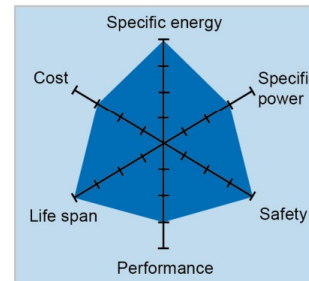
**Lithium Iron Phosphate**  
Li-phosphate  
(LiFePO<sub>4</sub>)



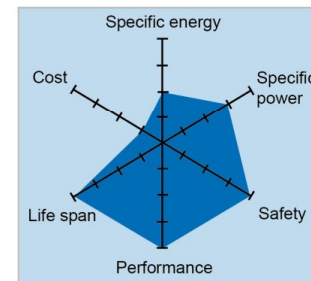
**Lithium Nickel Cobalt Aluminum Oxide**  
NCA  
(LiNiCoAlO<sub>2</sub>)



**Lithium Manganese Oxide**  
Li-manganese  
(LiMn<sub>2</sub>O<sub>4</sub>)



**Lithium Nickel Manganese Cobalt Oxide**  
NMC-TRIATHLON<sup>®</sup>  
(LiNiMnCoO<sub>2</sub>)



**Lithium Titanate**  
Li-titanate  
(Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>)

Specific Energy (Watts x Hour/Weight)  
Specific Power (Watts/Weight)

## Standardization – Cell Formats of Today / Future

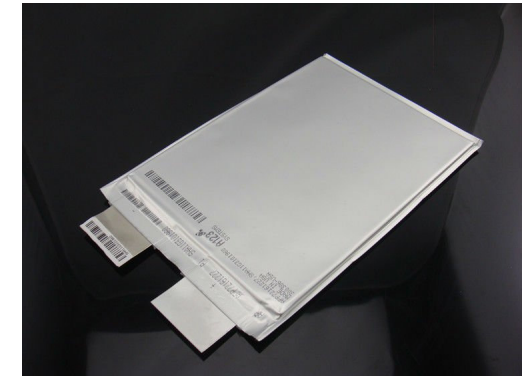
<https://www.rj-lithium.com/sale-11597451-lifepo4-prismatic-lithium-lifepo4-prismatic-cells-10ah-up-to-271ah-for-off-grid-energy-storage.html>



[https://www.alibaba.com/product-detail/21700-Li-ion-battery-4800mAh-5000mAh\\_62543472091.html](https://www.alibaba.com/product-detail/21700-Li-ion-battery-4800mAh-5000mAh_62543472091.html)



<http://www.powertechsystems.eu/en/li-ion-products/lithium-iron-phosphate-pouch-cells/>



**Tesla 4680**

**Battery Cell**

**5X**  
ENERGY

**+16%**  
RANGE

**6X**  
POWER

Tesla's upcoming 4680 battery cell / Source: Tesla

- 18650
- 21700
- Future 4680

- **Auto maker standardization is starting to go in the opposite direction**
  - **Starting to do their own thing**
    - **Each OEM is developing their own electrification platform architecture**
    - **Building platform for bottom-up car design**
    - **Forklift approach?**
  
- **Attempting to make power and performance a competitive advantage**

## Future Of Lithium-Ion Chemistries



### Cathode

- Cobalt free – *NMx* (SVOLT, LGES)
- Nickel rich – *NMC 9/0.5/0.5* (SK Innovation)
- Manganese rich – *NM* (VW Group)
- New combinations – *NCMA* (LGES)

### Anode

- Si-C – Si encapsulation / nanowire / nanofiber

*Advantages for a  
few more years...  
... and then?*

## Future of Lithium Based Batteries and Beyond

- Solid-State Battery

- Solid electrolyte
- Low power density, high energy density
- High temperature operation
- High safety

- Lithium-Sulfur

- High specific energies in the range of  $\sim 2$  MJ/kg (roughly 2x Li-ion)

- Lithium-Air

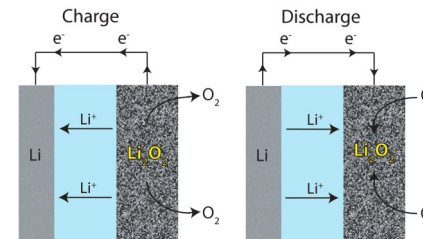
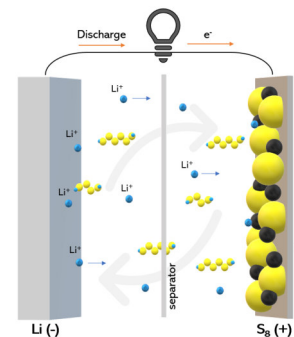
- Solid or liquid electrolyte possible
- High theoretical specific energy of up to  $\sim 40$  MJ/kg (gasoline:  $\sim 46.8$  MJ/kg)
- So far up to  $\sim 6$  MJ/kg (5x Li-ion) reached



New basic materials

🌐 *Sodium-ion* (Na) based batteries

- ▶ Cheaper
- ▶ Lower operation temperatures
- ▶ Commercially available for Energy Storage Systems not yet traction
  - CATL



# Triathlon Lithium-Ion Systems

## BATTERY SYSTEM SPECIFICATION

- ▶ Rated Voltages:  
24, 36, 48, 72, 80 volt
- ▶ Available battery system energy content:  
1.2 to 138 kWh
- ▶ Available capacities:  
52 to 1716 Ah
- ▶ Discharging temperature range:  
-18° F to +131° F
- ▶ Charging temperature range:  
-18° F to +131° F
- ▶ Storage temperature range:  
-4° F to +95° F
- ▶ Charge factor: 1.01 to 1.03



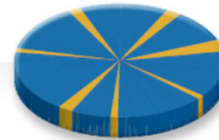
## CHARGING SYSTEM SPECIFICATION

- ▶ Voltages:  
24 to 80 volt
- ▶ Available charging power:  
1.4 to 36 kW
- ▶ Available charging currents:  
50 to 400 ampere
- ▶ Efficiency: 95 to 97 %
- ▶ No centralized charging station needed



### TRIATHLON® LITHIUM-ION BATTERY

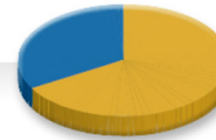
- Operating time approx. 21 - 22 h.
- Fast/Opportunity charging times approx. 2 - 3 h.



The operating time of the lift truck increases due to flexible fast/opportunity charging of the battery system.

### TRIATHLON® LEAD-ACID BATTERY

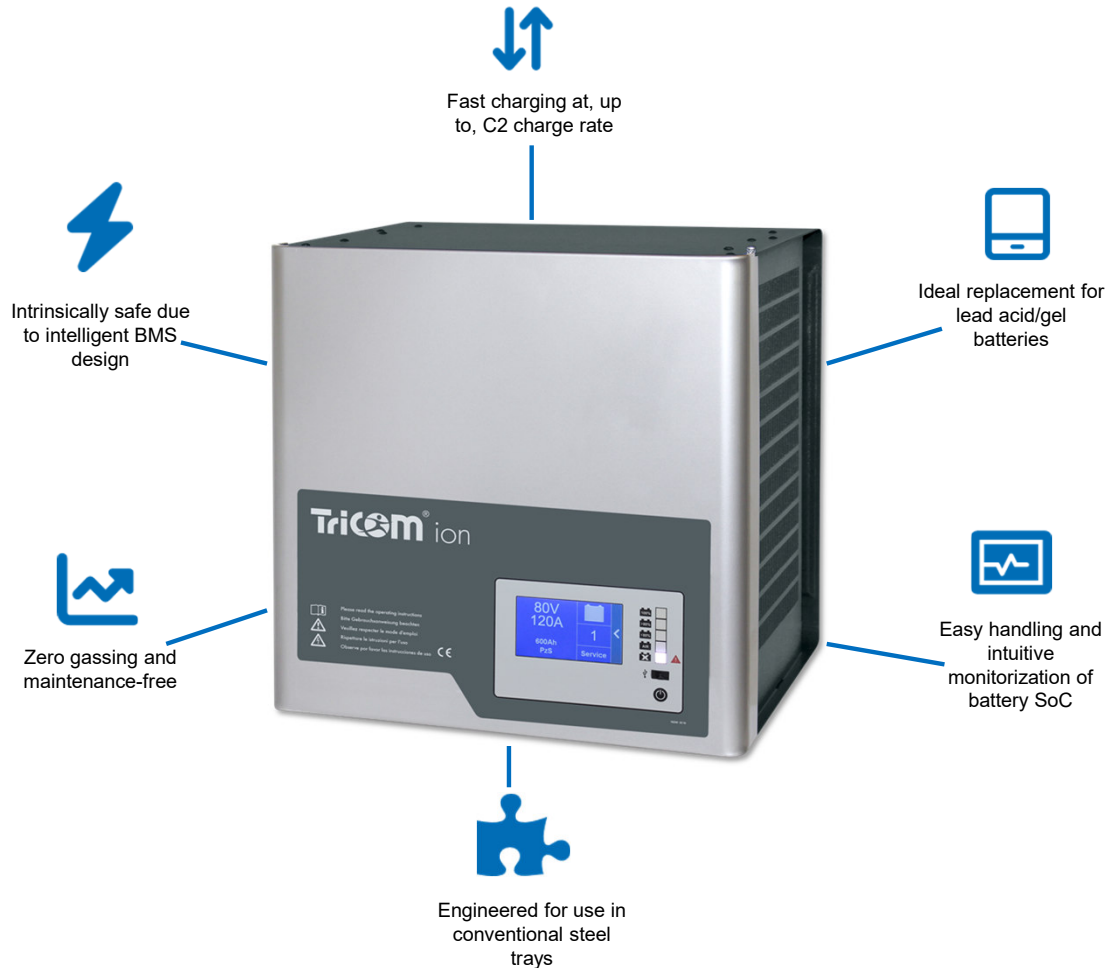
- Operating time approx. 8 h.
- Charging time/rest periods approx. 16 h.



Your lift truck can be used virtually "AROUND THE CLOCK" without a battery change.



## Charging Technology For Lithium-Ion Battery



- Permanently enables CAN communication between lithium battery and charger**
- Active charging and optimal charging controlled by CAN Communication to prevent human error**
- Safety, serviceability, intuitive design and highly efficient**

## Triathlon Lithium-Ion Systems – Global Compliance

### Most Globally compliant product

- ▶ UL2580 Lithium-Ion Battery system
- ▶ UL2580 Module
- ▶ UL tested CCU and Battery Management systems
- ▶ IEC 62619 – Fully compliant for safety and use in industrial applications
- ▶ CE – Compliant for EU and EU products

### Over 400 variants listed – one of the largest in the market

- ▶ UL Listed Capacities per tray on request
- ▶ UL 2580 for Cell – Module – Battery
- ▶ One of few companies with 80V Battery UL- listed in the market
- ▶ Freezer and Dual-Charger not included yet

### BBAS.MH63644 - Batteries for Use in Electric Vehicles

#### DETAILS

File No.: MH63644

UL Category: [BBAS](#)

Document Type: Listing

#### RESOURCES

#### Document Company Information

**Triathlon Batterien GmbH**  
Siemensstrasse 1+4  
Glauchau, 08371 Germany

Document Name	Company Name	Notes	UL CCN Description
<a href="#">BBAS.MH63644</a>	Triathlon Batterien GmbH	Historical	Batteries for Use in Electric Vehicles
<a href="#">BBAS.MH63644</a>	Triathlon Batterien GmbH		Batteries for Use in Electric Vehicles
<a href="#">BBAS2.MH63644</a>	Triathlon Batterien GmbH	Historical	Batteries for Use in Electric Vehicles - Component
<a href="#">BBAS2.MH63644</a>	Triathlon Batterien GmbH		Batteries for Use in Electric Vehicles - Component
<a href="#">BBAS8.MH63644</a>	Triathlon Batterien GmbH	Historical	Batteries for Use in Electric Vehicles Certified for Canada - Component
<a href="#">BBAS8.MH63644</a>	Triathlon Batterien GmbH		Batteries for Use in Electric Vehicles Certified for Canada - Component

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Batterietyp / Battery Type:  
**Lithium Ion**

Nennspannung / Nominal Voltage:  
**24 V DC**

Modul Typ / Module Type  
**TC7407-03**

Prod. Datum / Prod. Date:  
**15/2020**

Trogtyp / Tray Type:  
**80101UL-03-014-007-33**

Configuration Code / Configuration Code:  
**CC-00-00-00-18-10**

Designation Code - IEC62620  
**INP/148/27/98/[(2P7S)3P]/M/-30+60/100**

Seriennummer / Serial Number:  
**TC3279136**

Nennenergie / Nominal Energy:  
**5,67 kWh**

Nennkapazität / Nominal Capacity C1:  
**222 Ah**

Gewicht / Weight +5% -0%:  
**275 kg**

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Made in Germany:

Industrial Truck Battery IEC

## Energy Management Systems – MD LOADmanagement



Preventative support in avoiding high infrastructure costs



Significant operational energy cost savings



Optimizes and ensures highest fleet availability



Live view of individual chargers and SoC via TriVIEW



Flexible control of power limits



Perfectly integrated for TriCOM Ion series chargers



- Significantly reduces and manages peak time energy consumption from local mains

- Intelligent real time algorithm

- Optimizes power/current output to the networked chargers based on client need, peak energy times and operational prioritization

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## WHEN Should You Sell Lithium-Ion Systems

### **🌀 5 Year Truck Leases With Dollar Option Buyout On Lithium System**

- 🌀 1 Lithium System Over Life of 2 Leases – Guaranteed Replacement of Forklifts After First Lease Is Up
- 🌀 NMC Cycle Life of 5000-6000 Cycles with a Guarantee of 80% Useable Capacity

### **🌀 Replaces Fast Charge Lead Acid Customers – Lithium Makes Battery A Maintenance Free Solution**

- 🌀 No Watering
- 🌀 No Gassing
- 🌀 No Maintenance

### **🌀 Reduces Facility Footprint By Not Needing Battery Change Out Equipment**

- 🌀 Plug And Play Throughout The Facility With Designated Charging Areas Established Close To Break Rooms

### **🌀 Simplicity For The Operator**

- 🌀 Operator Training – Simple And Easy For Manager to Train New Employees

### **🌀 Best System For Food and Beverage Or Clean Environments**



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## WHY Should I Buy Lithium-Ion Systems


### **Total Cost of Ownership/ ROI**

-  Most return on investments with lithium systems show a return in less than 2 years when comparing to conventional lead acid or opportunity charge applications moving to lithium systems
-  Most return on investments with lithium systems show a return in less than 2 years when comparing to IC to lithium conversions



### **Safety**

-  No battery change outs / no special battery handling equipment needed
-  No exposure to acid
-  No risk of short circuit – 5 levels of fuses protect lithium system from battery to charger

### **Longer Life Cycle – Guaranteed 80% Usable Capacity Throughout Cycle Life Listed Below**

-  Lead Acid – 1500 to 1800 Cycles / Lithium LFP 3000 to 4000 Cycles / Lithium NMC 5000 – 6000 Cycles

### **More Power / Less Downtime = More Productivity For Customer**

-  With lithium holding constant voltage throughout discharge cycle a reduction in forklift capacity as seen in lead acid batteries is not shown with lithium batteries.
-  This allows for great production capacities to be seen in picking, deliveries and moving of products in all applications

### **Going Green Initiatives**



# Total Cost of Ownership / ROI – Lead Acid to Lithium Example

LEAD ACID TO LITHIUM ELECTRIC LIFT TRUCKS COST COMPARISON				
		Electric - Lead Acid	Electric - Lithium-Ion	
Truck Size		Voltage / Truck Model	Voltage / Truck Model	
Fuel Type		Electric	Electric	
Tire Type		Pneumatic	Pneumatic	
<b>Operational Data</b>				
Run Hours per shift		4	4	Please add how long they run per shift
Shifts per day		3	3	How many shifts per day
Work days per year		360	360	How many working days per year
Run Time Hrs per year		4,320	4,320	
<b>Ownership Costs</b>				
Machine Purchase Price				Voltage / Truck Model - Add your Truck Price
Battery Purchase Price		\$7,001.20	\$31,296.10	Lead Acid Battery Model / Lithium Battery Model
Charger Purchase Price		\$4,389.55	\$4,850.70	Lead Acid Charger Model / Lithium Charger Model
Total Purchase Price		\$11,390.75	\$36,146.80	
Expected Warranty Life (Yrs.)		4	8 yr / 2400 Cycles	
<b>Fuel Costs</b>				
Cost per unit		\$0.09	\$0.09	Per kWh
Consumption per Shift		59.83	50.8	
Cost per Shift		\$5.38	\$4.57	
Labor Costs / Tank Change/Fill per Shift		N/A	N/A	
Cost Customer Install Power Circuits Each		\$300.00	\$300.00	
<b>Maintenance/Repair Costs</b>				
Operating Cost per hour		\$3.750	\$0.450	Projected Truck & Battery
Annual Cost		\$16,200.00	\$1,944.00	
<b>Cost Comparison</b>				
Annual Owner Cost		\$11,390.75	\$36,146.80	Lead requires 2 batteries over 8 year span.
Annual Fuel Cost		\$5,815.48	\$4,937.76	
Annual Maintenance Cost		\$16,200.00	\$1,944.00	
Install Customer Power Circuit Cost		\$300.00	\$300.00	
<b>Total 1st Year Cost</b>		<b>\$33,706.23</b>	<b>\$43,328.56</b>	<b>-\$9,622.33</b>
Life of Asset	Years =	8	8	
<b>Total Lifetime Cost</b>		<b>\$199,205.31</b>	<b>\$91,500.88</b>	
<b>Total with Truck Quantity</b>				
Number of Trucks		17.00	17.00	
<b>Total Lifetime Cost</b>		<b>\$3,386,490</b>	<b>\$1,555,515</b>	<b>\$1,830,975</b>



# Total Cost of Ownership / ROI – IC to Lithium Example

INTERNAL COMBUSTION VS. ELECTRIC LIFT TRUCKS COST COMPARISON				
		Int. Combustion	Electric - Lithium-Ion	Lithium-Ion
Model#		Truck Model	Voltage / Truck Model	
Fuel Type		LPG	Electric	
Tire Type		Cushion	Cushion	
<b>Operational Data</b>				
Run Hours per shift		4	4	Please add how long they run per shift
Shifts per day		3	3	How many shifts per day
Work days per year		360	360	How many working days per year
Run Time Hrs per year		4,320	4,320	
<b>Ownership Costs</b>				
Machine Purchase Price				Voltage / Truck Model - Add your Truck Price
Battery Purchase Price		N/A	\$31,296.10	Lithium Battery Model
Charger Purchase Price		N/A	\$4,850.70	Lithium Charger Model
Total Purchase Price		\$0.00	\$36,146.80	
Expected Warranty Life (Yrs.)		8	8 yr / 2400 Cycles	
<b>Fuel Costs</b>				
Cost per unit	LPG Average	\$1.54	\$0.09	Per KWH
Consumption per Shift	Gallons	8	50.8	KWH
Cost per Shift		\$12.32	\$4.57	
Labor Costs / Tank Change/Fill per Shift		\$7.50	N/A	
Cost Customer Install Power Circuits Each		N/A	\$300.00	
<b>Maintenance Costs</b>				
Operating Cost per hour		\$3.750	\$0.450	Projected Full - Truck Only
Annual Cost		\$16,200.00	\$1,944.00	
<b>Cost Comparison</b>				
Annual Owner Cost		\$0.00	\$36,146.80	Purchase
Annual Fuel Cost		\$8,870.40	\$4,937.76	
Annual Tank Chg/Fill Cost		\$5,400.00	N/A	
Annual Maintenance Cost		\$16,200.00	\$1,944.00	
Install Customer Power Circuit Cost		N/A	\$300.00	
<b>Total 1st Year Cost</b>		<b>\$30,470.40</b>	<b>\$43,328.56</b>	<b>\$12,858.16</b>
Life of Asset	Years =	8	8	
<b>Total Lifetime Cost</b>		<b>\$243,763.20</b>	<b>\$91,500.88</b>	<b>\$152,262.32</b>
<b>Total with Truck Quantity</b>				
Number of Trucks		17.00	17.00	
<b>Total Lifetime Cost</b>		<b>\$4,143,974</b>	<b>\$1,555,515</b>	<b>\$2,588,459</b>

## Triathlon Lithium-Ion Systems – Internal Battery Safeguards

### Battery Protection

- **Cells:** Safety fuse integrated into each cell
- **Modules:** Electronic monitoring of individual cells and breaker for each module
- **Battery:** Electronic breaker and mechanical fuse for the entire battery
- **Charging:** Electronic breaker and mechanical fuse for the entire battery when charging
- Cells, modules and batteries are made to the UN 38.3 standard

### Electrical Advantages

- Short-circuit prevention
- Active shut down of the system in case of overload and short- circuit
- Deep discharge protection
- Overcharge protection
- Warning to the driver before the discharge limit is reached
- The battery controls the charger
- Protection against using the wrong charger
- Drive protection when charging

### Active Monitoring

- CCU (Central Control Unit) oversees all cells in each module
- CCU is alarms are activated when:
  - Cell voltages are over or under
  - Cell temperatures are too high
  - High/abnormal current is detected
- All system errors are logged in the system and are available to the service technicians
- All usage data is stored permanently for recall and reporting

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## Triathlon Lithium-Ion Systems Vs Competitors Lithium in US: Key Advantages

### • TRIATHLON LITHIUM-ION SYSTEMS

- 4<sup>th</sup> generation in 2022
- NMC (Lithium Nickel Manganese Cobalt Oxide)
  - Quality suppliers—internal/3<sup>rd</sup> party testing
  - Allows for two truck life cycles
- 100% depth-of-discharge
- Closely follows path of automotive industry EV market
- Full ownership of BMS—Separate company owned by Triathlon
  - Fully integrated battery management system—software and hardware
- 3-4 Ah flexible capacities ranges per lithium battery size
- UL Listed over 400+ lithium batteries
- Lead Out/ Lithium In – Serviceability by using lead if needed at any point in time

### • COMPETITOR LITHIUM-ION SYSTEMS

- 1<sup>st</sup> generation
- LFP or LiFePO<sub>4</sub> (Lithium Iron Phosphate)
  - Quality and reliability vary
  - 1 truck life cycle
- 80% depth-of-discharge
- Trails AFTER the automotive industry
- May be proprietary but not “In-House”
- Not as flexible in Ah capacities – Sometimes 1-2 Ah capacities available per truck. Example one small capacity and one large capacity size available per truck
- Just starting to work through UL listing. Many UL registered but not listed. Small number of batteries listed
- Trucks built with integrated lithium system limits ability to use lead acid option if needed

# Triathlon Lithium-Ion System: Qualification Questionnaire

## Lithium-Ion Battery Qualification Questionnaire

Customer:

Contact Name:  Email:

Address:   
  
 Phone:

Answer the questions listed on the left side and use the talking points on the right side (in gray) to guide the conversation with your customer.

### Questionnaire

Why are lithium-ion batteries being considered in this application?

What are your expectations for battery life?

### Application Information

Does your business have seasonal trends?  Yes  No

Describe lift truck activity during the seasonal peaks?

What type of growth do we need to plan for?

Have you explored using lithium-ion batteries before?   
 With who?

### Talking Points

- Longer battery life*      *Warranty*
- Extended Run Time*    *No Battery Acid*
- Faster Charge Rate*    *More Consistent Power Output*
- Maintenance Free*     *Eliminate Battery Changing*

*Lithium-ion batteries typically have at least twice the life of a similar powered lead-acid battery.*

*Customers must plan for seasonal business trends to prepare for any possible power requirements.*

- Extended Shifts*
- Additional Shifts*
- Additional Days of the week*

# Triathlon Lithium-Ion System: Qualification Questionnaire

What AC power is available currently? (Circle the phase and voltage and fill in the breaker size)

Phase	Voltage	Breaker Size:	Phase	Voltage	Breaker Size
1	208		1	240	
3	208		3	240	
3	480		3	600	

*These values help determine the maximum size battery charger that can be utilized in the application. Lithium-ion batteries can accept higher charge rates, which will allow faster charging and require more power than is currently in place.*

Can this be upgraded?  Yes  No

*Does the Electrical service to the building have additional power required to increase the infrastructure for lithium-ion batteries?*

### Lift Truck and Battery Information

We need to confirm that the lift truck models they need are lithium-ion ready. If you are unsure, ask your Sales Manager or Regional Motive Power Specialist.

Current Lift Truck Fleet:

Lift Truck Model	Lift Truck Serial No.	Voltage	Operation Temp. Range	Batteries per Lift Truck	Avg Weekly Operating Hours	Battery Model Number	Ah	Charger Model	DC Amp Output

Is the environment an ambient temperature? \_\_\_\_\_

Is it a freezer application? Yes No If yes, What temperature? \_\_\_\_\_

What are your current Ah requirements? (A power study confirms the Ah currently being used)

\_\_\_\_\_

### Charging Commitments:

Shifts:

	Start Time	End Time
1 <sup>st</sup> Shift		
2 <sup>nd</sup> Shift		
3 <sup>rd</sup> Shift		

1<sup>st</sup> Shift Breaks:

Break Times	Duration

2<sup>nd</sup> Shift Breaks:

Break Times	Duration

3<sup>rd</sup> Shift Breaks:

Break Times	Duration

How many days of operation per week?

\_\_\_\_\_

Please circle the current Battery Charging Method

Conventional  Opportunity  Fast

# Triathlon Lithium-Ion System: Battery Simulator Report

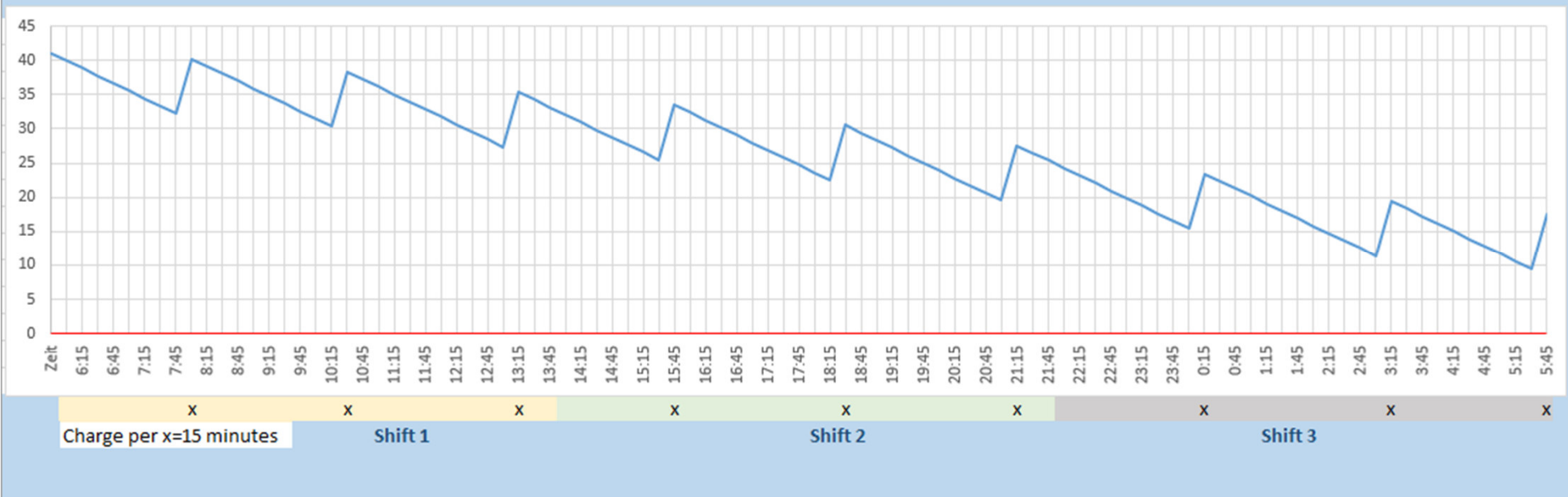
Voltage [V]	80
Capacity lead [Ah]	650
Proposal lithium	433
Capacity lithium	518
Charge current [A]	400
Type	TC 7411-14
Charge time [h]	1.2
Energy [kWh]	41

Shifts	3
Weeks	52
Days per week	7
Operating hours annual	4000
Operating time lead [h]	9
Consumption [kwh/h]	4.39

Truck type	
Customer	
Project	
Date	
Editor	



Simulation energy content 24 hours



# Triathlon Lithium-Ion System: Battery Simulator Report

Voltage [V]	48
Capacity Pb [Ah]	810
Qty. Modules max.	21
Qty. Modules	20
Charge current [A]	300
Type	TC 2614-20 TCT4300
Capacity Li [Ah]	520
Energy [kWh]	27

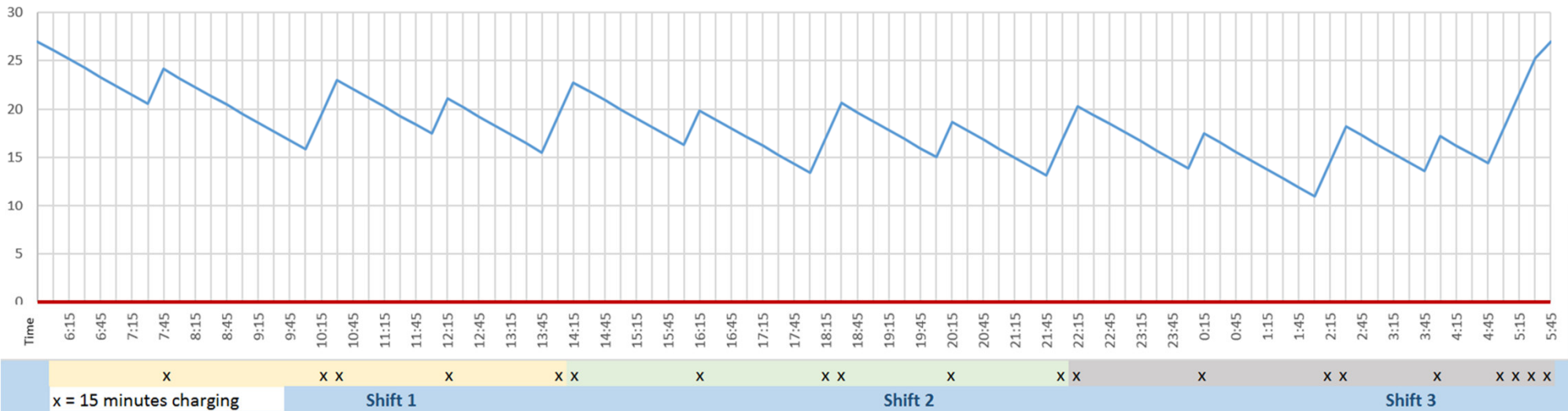
Working Shifts	2
Weeks per year	50
Day per week	5
Operating hours per yr	2000
Usage time Pb [h]	8
Consumption [kwh/h]	3.69

Vehicle type	
Manufacturer	
Customer	Triathlon US



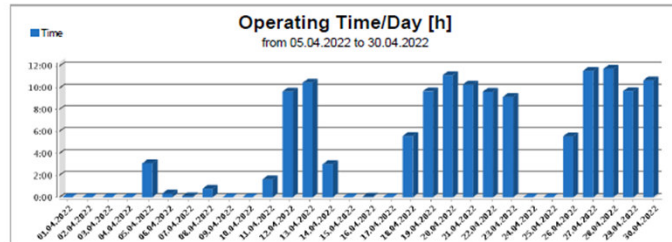
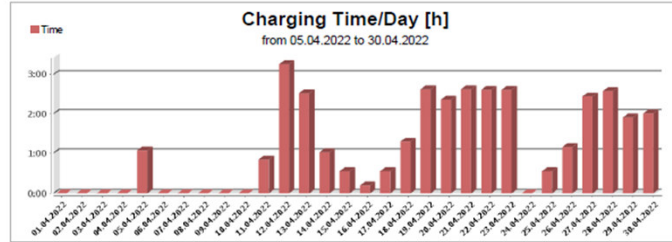
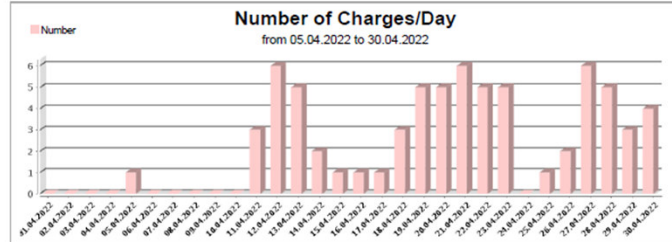
Date	11/1/2016
Name	End User Customer

Simulation energy content [kWh] acrosss 24 hours usage



# Triathlon Lithium-Ion Systems: Accessible Battery Reports

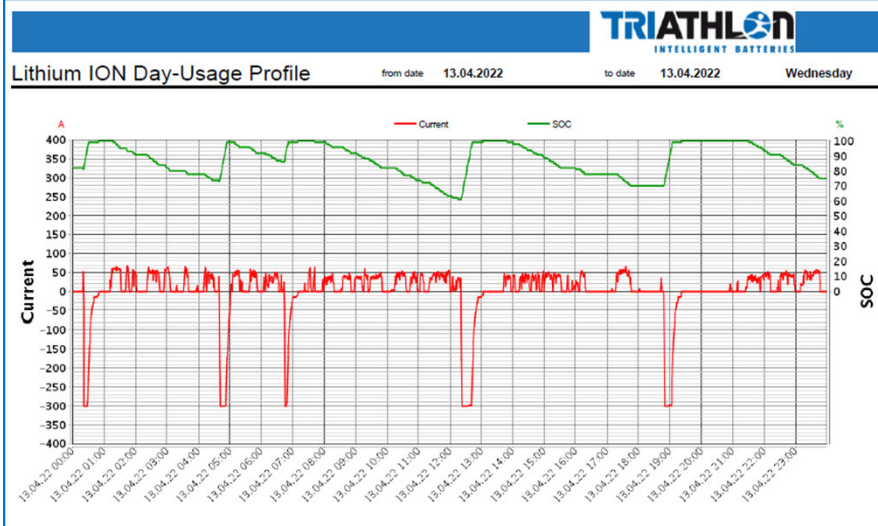
## Lithium ION Usage Profile



**Lithium ION Battery Report**

TC3456911\_20220504\_13h24m31s\_Report  
RECIBO.csv

Date	Discharges						Charges						Standby/break time										
	Qty	[h]	2-15	15-30	30-60	>60	[Ah]	[kWh]	Qty	[h]	2-15	15-30	30-60	>60	[Ah]	[kWh]	Qty	[h]	2-15	15-30	30-60	>60	
16.04.2022 Sat	2	03:04	2	0	0	0	1.5	0.1	1	00:12	1	0	0	0	-4.2	-0.5	3	23:44	0	1	0	2	
17.04.2022 Sun	0	00:00	0	0	0	0	0.0	0.0	1	00:32	0	0	1	0	-7.9	-0.7	2	23:28	0	0	0	2	
18.04.2022 Mon	32	05:36	24	7	1	0	257.8	21.9	3	01:17	1	1	1	0	-182.7	-15.8	36	17:07	28	4	1	3	
19.04.2022 Tue	52	06:41	33	18	1	0	483.2	38.6	5	02:37	1	2	2	0	-500.1	-42.4	50	11:42	39	6	3	2	
20.04.2022 Wed	48	11:09	27	18	3	0	510.0	42.2	5	02:21	0	4	1	0	-541.6	-45.6	44	10:30	30	10	3	1	
21.04.2022 Thu	52	10:17	33	15	3	0	427.1	36.3	6	02:37	0	4	2	0	-431.5	-37.2	43	11:06	25	15	2	1	
22.04.2022 Fri	43	09:39	23	18	2	0	403.6	34.2	5	02:36	0	1	4	0	-419.0	-36.1	38	11:45	23	9	3	3	
23.04.2022 Sat	37	09:10	22	12	3	0	391.7	33.0	5	02:36	0	2	3	0	-491.9	-42.2	33	12:14	19	9	4	1	
24.04.2022 Sun	0	00:00	0	0	0	0	0.0	0.0	0	00:00	0	0	0	0	0.0	0.0	1	24:00	0	0	0	0	1
25.04.2022 Mon	0	00:00	0	0	0	0	0.0	0.0	1	00:32	0	0	1	0	-8.0	-0.7	2	23:28	0	0	0	2	
26.04.2022 Tue	26	05:34	19	8	1	0	237.0	20.1	2	01:09	0	1	1	0	-166.1	-14.3	37	17:17	19	12	4	2	
27.04.2022 Wed	56	11:33	35	21	0	0	527.0	43.3	6	02:26	1	4	1	0	-550.3	-46.1	51	10:01	33	14	2	1	
28.04.2022 Thu	57	11:43	33	23	1	0	515.2	43.2	5	02:34	0	3	2	0	-539.2	-46.0	52	09:42	39	11	1	1	
29.04.2022 Fri	40	09:42	19	17	3	0	424.0	35.0	3	01:54	0	1	2	0	-409.6	-34.5	38	12:24	23	11	1	3	
30.04.2022 Sat	39	10:40	19	15	5	0	449.3	36.9	4	02:00	0	2	2	0	-466.7	-42.4	37	11:20	24	8	2	3	
01.05.2022 Sun	12	03:50	5	5	2	0	145.4	11.7	2	01:02	1	0	1	0	-222.8	-18.6	11	19:08	7	1	2	1	
02.05.2022 Mon	34	06:53	24	9	1	0	311.3	26.2	2	01:20	0	0	2	0	-223.8	-19.2	34	15:47	23	5	4	2	
03.05.2022 Tue	45	11:03	24	17	2	1	531.5	43.5	4	02:23	0	1	3	0	-576.7	-48.1	32	10:34	17	7	5	3	
04.05.2022 Wed	29	07:10	15	13	1	0	341.0	27.8	2	01:27	0	0	2	0	-389.2	-32.4	22	04:48	16	4	2	0	



**Lithium ION Energy profile**

TC3456911\_20220504\_13h24m31s\_Report RECIBO.csv

Application Data	
Active Operating Days	[d] 105
Active Operating Hours	[h] 133
Standby/break time	[h] 2337
Withdrawn DC power	[kWh] 687
Charging time	[h] 56
Electricity Cost	[€ / \$] [kWh] 6,18

Energy costs [€ / \$ / kWh]		[Cost] [€ / \$ / kWh]	[Efficiency] [€ / \$ / kWh]	[CO2 Emission]	[Efficiency]
50Hz Standard	[kWh] 230,44	95,99	1280	766 kg	52,1%
TRICOM XL	[kWh] 260,77	86,37	1115	607 kg	59,8%
HF Standard	[kWh] 204,18	69,73	1134	678 kg	58,8%
TRICOM FUTUR	[kWh] 171,76	37,31	954	571 kg	69,9%
TRICOM Ion	[kWh] 134,45	-	747	447 kg	89,3%

The battery read report log provides detailed information regarding the operational use of the battery relative to:

- Battery charge/discharge/standby time
- Number of battery charges/discharges/moments in standby
- Current (A) used during charge phase
- Battery capacity (Ah) used during discharge phase
- Charging profile to ensure that operators are charging batteries correctly

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## The Aftermarket Approach To Servicing Lithium-Ion Systems

### 🌐 Triathlon Independent Agents

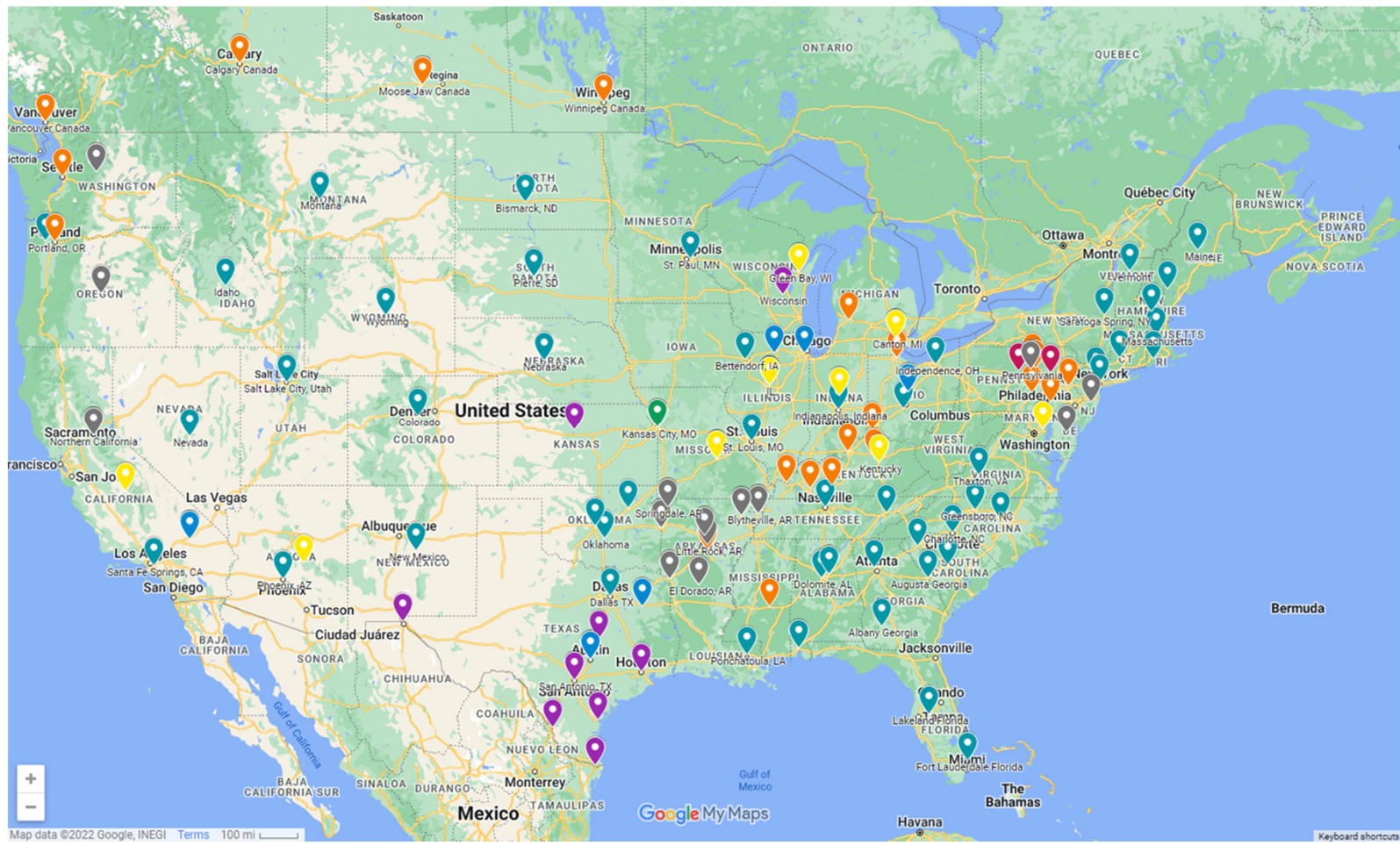
- ▶ US Coverage – Approximately 90% service by independent agents.
- ▶ Fully trained on all Triathlon products.

### 🌐 Forklift Dealer Agents

- ▶ Many Forklift Dealers in US, Canada and Mexico will work directly with Triathlon and provide sales and service for all Triathlon products.
- ▶ If independent is not in forklift dealer market or a conflict of interest is determined, then Triathlon is open to having discussions with the forklift agent to become a service and sales distributor of the Triathlon product.
- ▶ Contact Triathlon to discuss this opportunity.



# TRIATHLON Battery Solutions Sales and Service Network – US and Canada





**TRIATHLON<sup>®</sup>**  
GROUP

**Thank you for your attention.**

