



Lithium-ion battery

Understanding Lithium-ion



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It was not until the early 1970s that the first nonrechargeable lithium batteries became commercially available. Attempts to develop rechargeable lithium batteries followed in the 1980s but the endeavor failed because of instabilities in the metallic lithium used as anode material.

Mixing cathode and anode material allows manufacturers to strengthen intrinsic gualities; however, an enhancement in one area may compromise something else. Battery makers can, for example, optimize specific energy (capacity) for extended runtime, increase specific power for improved current loading, extend service life for better longevity, and enhance safety for strenuous environmental exposure, but, the drawback on higher capacity is reduced loading; optimization for high current handling lowers the specific energy, and making it a rugged cell for long life and improved safety increases battery size and adds to the cost due to a thicker separator. The separator is said to be the most expensive part of a battery.

Lithium Nickel Manganese Cobalt Oxide (LiNiMnCoO₂) – NMC Since 2008

Specific energy	Voltages	3.60V, 3.70V nominal; typical operating range 3.0– 4.2V/cell, or higher
Cost Specific power	Specific energy (capacity)	150–220Wh/kg
Life span Safety Perform	Charge (C-rate)	0.7–1C, charges to 4.20V, some go to 4.30V; 3h charge typical. Charge current above 1C shortens battery life.
	Discharge (C-rate)	1C; 2C possible on some cells; 2.50V cut-off
ance	Cycle life	1000–2000 (related to depth of discharge, temperature)

Lithium Iron Phosphate(LiFePO₄) – LFP Since 1996







How to Apply Test the battery Install a screen to view % Install the battery Go live with current and assemble it on the forklift. battery. The customer measurements into a weighted can't view the same screen while using it. Keep tank. on the forklift because it's log data as graphs. (Counterweight) a different type of battery. (Calculation is different) KOMATSU

e e	Lead Acid	Lithium-Ion
Charging Time	8 hours	3 – 4 hours
Cool-Down Period	8 Hours	Not Needed
Charging Method	Removed from forklift, placed in charging base and taken to special charging storage room	Plugged directly into the wall, even while the battery is installed in the forklift
Safe Discharge	Down to 30% - 50% capacity	Down to 20% capacity
Opportunity Charge	No	Yes

Lithium-ion batteries have a long life expectancy if used correctly. This is a distinct advantage for operations that rely on efficiency and high production levels.

Contributing to longer lithium-ion life cycles includes:

- Higher power density level
- Slower rate of capacity loss

lithium-ion battery is around 5 year or at least 2,000 charging cycle. But, if well cared for and used in proper condition, lithium-ion batteries can last as long as 3,000 cycles.

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Counter balance/Reach truck





Volt	Ah
48	200
48	240
48	320
48	400
80	200
80	240

Power pallet/Stacker



Vo	lt	Ah
24	4	100
24	4	120
4	8	100
4	8	200

Charger

Lithium-ion battery design for use Lithium charger only





Volt	Α
24 ,48, 80	40,50,60,80,100



Charge station

Battery voltage data logger

Voltage Data Loggers can be used for a wide variety of applications including monitoring energy consumption, detecting charging and discharging, as well as for recording the low voltage output of sensors.







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