Power System Management

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Battery Life Calculator

Using following formula:

battery life = capacity / consumption * (1- discharge safety)

Where;

- Capacity is the capacity of your battery, measured in ampere hours. You can usually find this value printed on your battery.
- Consumption is the average current draw of your electronic device, expressed in amperes. (If you want to learn more about the electric current, make sure to check out the Ohm's law calculator!)
- Discharge safety is the percentage of your battery capacity that is never used. For example, if you use a LiPo battery to fly a drone, you should never discharge it below 20% - otherwise, it can be damaged. Our battery life calculator assumes a default discharge safety of 20%, but feel free to change it as you wish.

In the advanced mode, you can adjust the following additional parameters:

- Awake time is simply the time that your device is not sleeping during one operational cycle (e.g. 2 seconds.)
- Consumption in sleep mode is the average consumption of your device in sleep mode, measured in amperes.
- Sleep time is the time that your device spends sleeping during one operation cycle.

The average consumption according to the equation:

Average consumption = (consumption1 * time1 + consumption2 * time2) / (time1 + time2)

Type of Batteries

Primary (non-rechargeable)

- A convenient sources of power for portable electronics and devices. (radios, watches, toys, lights, camera, and more.)
- Since they can't be recharged once they run out of power, they can't be used again.
- Inexpensive, lightweight, and convenient to use with no maintenance.
- They usually come in a cylindrical form (Alkaline batteries), a coin-shaped (coin cell batteries).
- Types: Alkaline, Magnesium, Mercury, Lithium/Solid Cathode, Lithium/Soluble Cathode, Lithium/Solid Electrolyte, Silver/Zinc, Zinc – Carbon

Secondary (rechargeable)

- Can be recharged and reused.
- Usually cost more than primary ones. But considering they're rechargeable, they can have a longer lifespan.
- Used for two applications;
- First, energy storage devices. (Uninterrupted Power Supplies (UPS) and Hybrid Electric Vehicles (HEV))
- Second, applications where the battery is used and discharged as a primary battery. (Mobiles, Laptops, Electric vehicles)
- Types: Nickel – Cadmium Batteries, Nickel – Metal Hydride Batteries.

Battery Applications

Primary and secondary batteries are both used in a lot of appliances, such as:

- Portable electronic devices: Smartphones, watches, cameras, laptops, calculators, including testing equipment like multimeters.
- Entertainment: Radios, MP3 and CD players, infrared remote controls, toys and games, etc.
- Household: Smoke detectors, alarms, clocks, UPS, portable power tools, and more.

Alkaline Batteries

- 9V Alkaline batteries. Reliable power for your everyday devices like motorized toys, flashlights, portable games consoles, remote controls, CD players, etc.
- Alkaline specialty batteries. For cameras, car remotes and more.
- AA Alkaline batteries.
- AAA Alkaline batteries.
- C & D Alkaline batteries.

Lithium Batteries

Reliable and longer life. Unlike alkaline batteries, high-performance Lithium batteries boast an exceptional shelf life. This means they will be ready when you need them. See the full range of Lithium batteries here.

- 3V coin cell Lithium batteries. Reliable performance. Often used in heart-rate monitors, keyless entry, glucose monitors, toys & games.
- LiFePO4 Lithium batteries
- Lithium specialty batteries
- Memory backup lithium batteries
- PLC Lithium batteries

Rechargeable Batteries

In a life full of energy you don't want to be stopped. That's why you use rechargeable batteries – you'll never run out if you keep some of these handy batteries charged!

- Available in Lithium, Ni-Cad, NiMH and battery packs.
- Lithium rechargeable batteries
- Ni-Cad rechargeable batteries
- NiMH rechargeable batteries
- Rechargeable battery packs

Sealed Lead-acid Batteries

- Browse through our high performance, multi-purpose lead-acid batteries here. They provide dependable primary and backup power in domestic and also commercial applications.

- You might also like this NBN replacement battery (BA5160CY2). It's perfect for most NBN connection boxes.

- Replace your flat NBN™ connection box backup battery with a 100% compliant, Australian supplied battery.
- Keep your internet connection and phone line running during power outages.
- Completely DIY – no service calls needed. Just unplug your old one, and plug in the new one.

Wireless Charging AGV

- An inductive wireless charging system AGVs and AMRs can contactless battery opportunity charging.
- Count on a stationary active fixed coil on the floor on the wall and on a mobile passive coil on the robot.
- The active coil generates a magnetic field that induces an alternated current in the mobile coil.

The main AGV and AMR Wireless Charging Systems manufacturers are

- B&PLUS
- Daihen
- Delta Energy Systems
- In2Power
- WiBotic
- Wiferion

Mobile Robots Battery Charging Solution

Opportunity charging

- For mobile robots, permits batteries to be charged several times during its working hours. The autonomous mobile robot or AGV goes to defined charging stations and performs charging while waiting for a new mission to be delivered. If the battery balance is properly calculated, the vehicle could never need a change of battery.
- If we think about "wireless charging“ we can only consider the first strategy, so the “opportunity charging”. Opportunity charging can be performed with the classical “contact charging” method or withthe newest “contactless charging” technology.

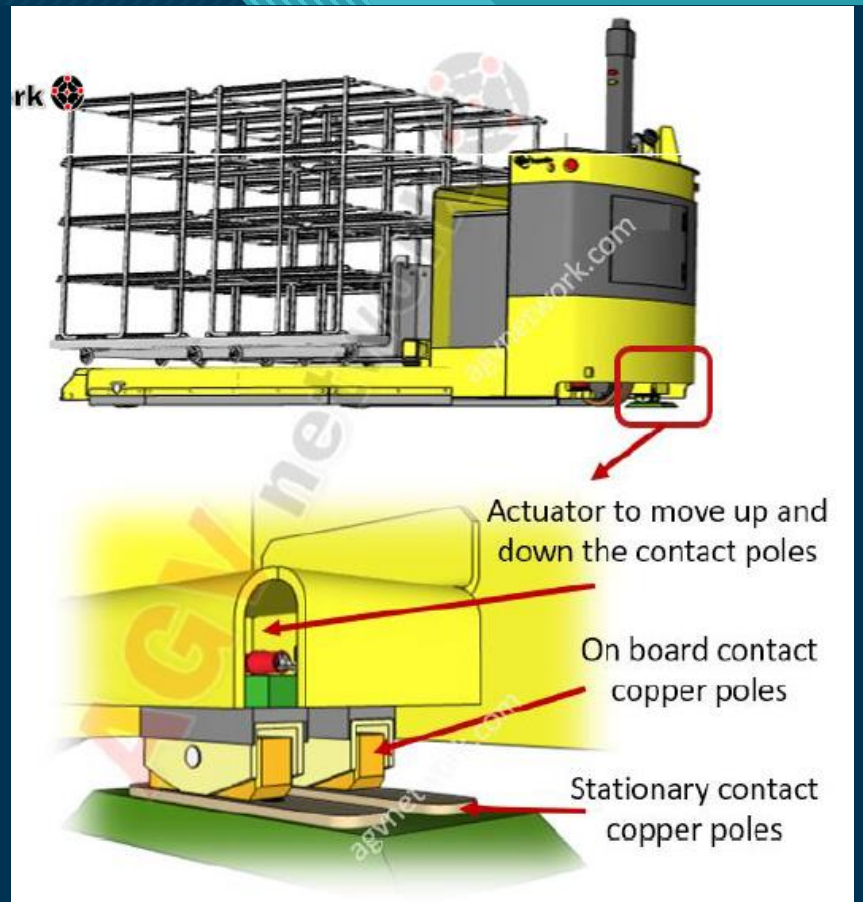
Battery Swap Strategy

- The mobile robot works with a single battery until it is fully drained that need to be swapped with a fully charged one. Battery swapping can be done manually or automatically as needed or on a schedule.

How does Wireless Charging for AMR and AGV work?

AGV and AMR contact charging system

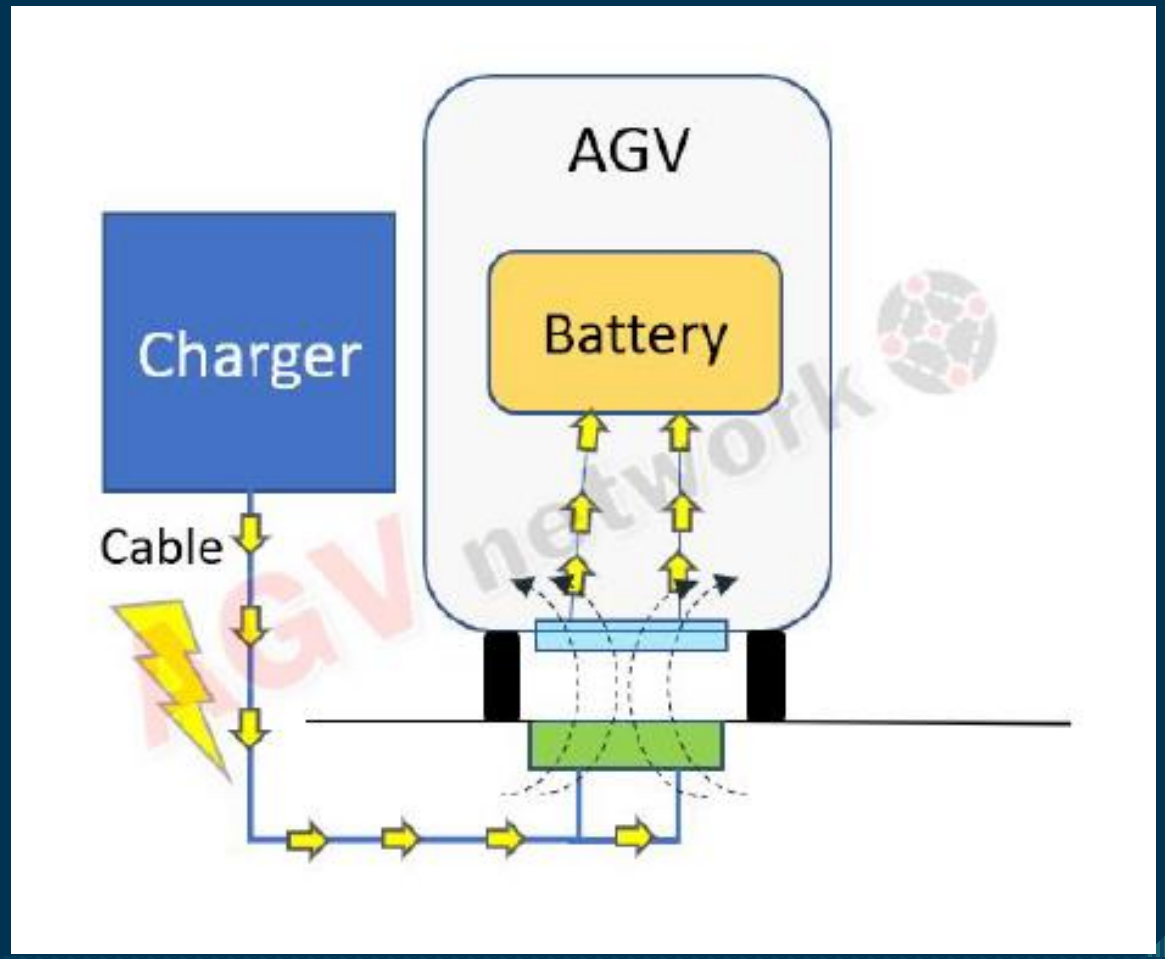
- There is a physical connection between the charging poles.
- The AGV with the onboard charging poles arrives to the charging station. The charging station is composed by the stationary contact poles and the charger.
- The AGV moves down the contact poles, in general, tanks to a linear actuator.
- The poles (onboard and stationary) touch. The charger verifies the voltage differential and starts the charging cycle.



AGV with contact charging poles

AGV and AMR wireless charging system

- The power transfer is done without any physical contact
- The AGV with the onboard charging "coil" arrives to the charging station. The charging station is composed by the "stationary coil" and the charger.
- As soon as the onboard coil and the stationary coil overlap, the power is "magically“ transferred without any contact thanks to the inductive principle.



What batteries are suitable for inductive charging?

Inductive charging is compatible with all battery types:

- Open Lead Acid Batteries
- GEL/AGM Batteries
- Pure Lead Batteries
- Lithium Batteries
- Lithium or Pure Lead batteries are the best option for AGVs or AMRs performing opportunity charging.
- Lithium batteries are able to take advantage of all of the
- Inductive wireless charging advantages

The advantages to Wireless Charging For AGV and AMR Robots

- High Efficiency 93%-95%
- Full Power Of High-Energy Streams Immediately After Start
- No Wear And Tear Or Maintenance As There Are No Contacts Involved
- High Mobile Robot Positioning Tolerance Compared To Contacts And Omnidirectional Charging
- One single wireless charging system can supply power to different vehicles and batteries
- Intelligent data transfer during wireless charging