



Automated Cell Finishing Lines For large format cells



PEC offers solutions for all process steps after the electrolyte filling either in a fully automatic or manual system. This includes Formation, Degassing, Ageing, Grading (capacity definition), Sorting (based on quality), Pack Assembly and End of Line Testing. Our equipment is designed for small, middle and large scale battery manufacturers for all advanced energy storage applications: stationary, aerospace, defense and automotive (e.g. HEV, PHEV, EV...).

Our solution consists of building blocks: Formation & Grading towers, Degassing Stations, Input & Sorting Stations,... By placing additional formation towers or degassing stations in line, the capacity of the system can easily be increased which makes it very modular.

Material Handling

The cells or modules (Pouch, Cylindrical, Prismatic type) that enter the formation line are loaded on a customized pallet. Product and carrier are all uniquely identified with barcode/RFID tag. This pallet is transported from and to the different functional parts throughout the entire process with an Automated Store and Retrieval System (ASRS crane).

Formation & Grading Tower

A formation or grading tower consists out of 1 to 3 formation or grading stations, depending on the cell size and power requirements. A fire box (with heat shielding inside and exhaust/ventilation pipes) around each station will prevent possible incidents to propagate through the factory. Each station can handle 1 pallet with cells at a time. The formation or grading cycles are started after the station made automatic contact with the cells.

HIGHLIGHTS

For different types of cells (pouch, prismatic, cylindrical types,...)

High volume automated line from 500 channels and up

Turn-key solution for loading, formation, degassing, grading, ageing and sorting of cells

Very Modular: all functional parts are designed as building blocks: e.g. Formation & Grading tower, Degassing Station, Sorting Station, Ageing Warehouse....

Multi-level Safety Features on process (software controlled stops / fuses), station (watchdog, external IO) and formation environment (gas, heat detection,...) level

Mechanics

Customized product carrier (pallet) and cell connections

Protective Fire Box for each formation station with heat shielding, conditioning and exhaust pipes

Clamping of prismatic and pouch cells during formation

Electronics

Individual channel control with on-board microcontroller

Full linear load (Power Mosfet)

Liquid cooled electronics

Very Fast Switching times for accurate peak power calculations

Accuracy 0.1% FSD with 2 current ranges

Automation

Lights-out operation

Automatic Store & Retrieval System for pallets movements



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Formation Software

The PEC formation Software is part of a complete manufacturing software solution, called MWare, covering all the functionalities required in cell and battery manufacturing plants. MWare is an in-house developed application that reflects our long history and experience in battery production.

MWare supports the sequence of production steps from receiving raw materials over slurry mixing, coating, to the cell assembly. After the cell assembly, cells need to be formed, aged and graded before they are assembled into modules and packs. PEC provides turn-key automated systems for these process steps, automating the complete cell handling from the electrolyte filling to the formed and sorted cells.

Specifically for these automated lines, the PEC formation software, part of the overall MWare solution, gives a complete answer to the following functional domains:

Manufacturing and Logistics Execution System

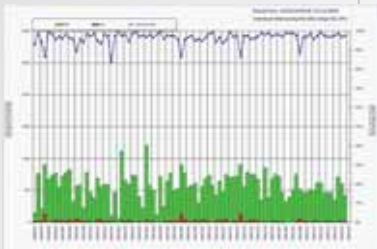
Process Control (creating and starting the correct formation and grading programs)

Order management and planning (managing the flow through the line)

Cell level traceability and quality assurance

Validation and rejecting the cells based on the measurement results

Management of the material handling systems



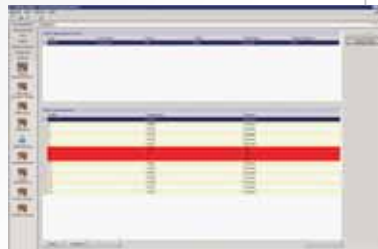
Operator Control System

Monitoring the processes, the equipment and the material handling systems

Alarm management and operator notification

Check Measurement results

Calibration Procedures



Reporting System

Monitoring order progress and work in progress

Analyzing and inspecting the results

Statistical analysis and trends (Yield report, Pareto Analysis of error codes, Production Progress reports...)



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