

# Battery Manufacturing Equipment

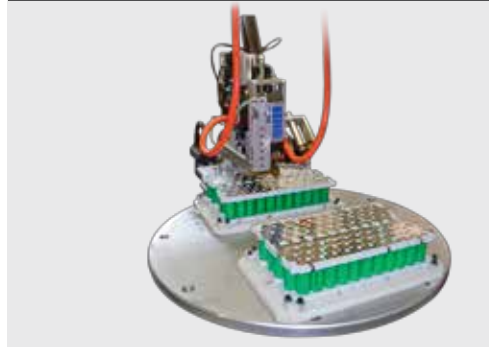
Greenlight's Industrial Automation division specializes in the fabrication of custom battery manufacturing and testing machinery:



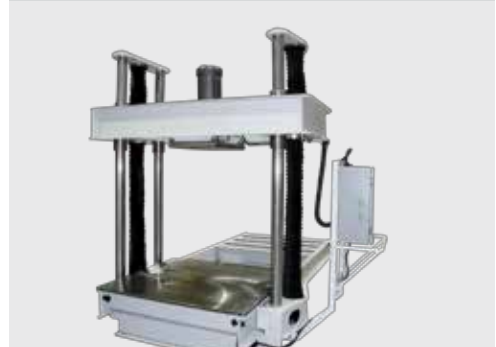
*Robotic Manufacturing Systems*



*Assembly Press Fixture*



*Battery Pack Welding*



*Flow Battery Assembly Press*



*Li-ion Cathode Seal and Cut Machine*

## Lithium Cell Winder

- » Fast cycle time with automatic cell reject module.
- » Fully controllable tension on all webs.
- » Semi-automatic splicing stations on Lithium and Celgard.

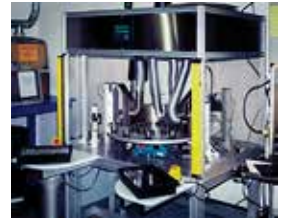
### Options include:

- » Cathode supply on a roll; Camera for monitoring cathode quality; Automatic cell-into-can loading carousel; Built in data collection.



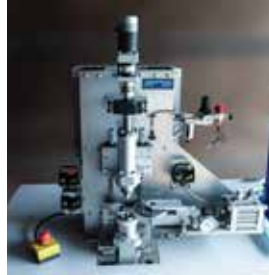
## Conformal Coating Machine

- » Spays conformal coating to top half of cell, dries coating, flips cell and coats and dries other end for complete coverage.
- » Cycle time of approx. 40 cells/minute.
- » Cell sizes from 18650 to 35700 (Ø18mm to 35mm) Customs sizes are available.
- » Adjustable parameters include spray time, volume and size of spray cone.



## Battery Can Grooving Machine

- » Suitable for pilot scale and R & D production of 18650 cells.
- » Programmable grooving machine for top groove geometry and position.
- » Software adjustable parameters for feed of grooving wheel, rotation of can, and feed of top and bottom can compression surfaces for precise control of groove geometry.



## Coater/Dryer Packages

### Coater packages:

- » Specializing in thin film reverse roll coating for Li-Ion and catalyst coating for fuel cell production.
- » Widths from 300mm, speeds dependent on oven configuration.
- » Hardened, chromed and ground rollers, highly accurate coating control.



### Dryer packages:

- » Infrared with closed loop control, or convection, or a combination of both.
- » Optional Yasui Seiki, Hirano or Coatema coating machines.

## Cap to Can Insertion Machines

- » Precision press determines if cap has been pressed flat with top of can.
- » Suitable for subsequent laser or TIG welding of cap to can.
- » Fast cycle time of 2 seconds.



## 'Jelly Roll' to Can Insertion Machines

- » Inserts bottom insulators and wound cells into cans, and places top insulators.
- » Cycle time of 35 cells/minute.
- » Cells are automatically loaded into 100 cell trays.



## Automated Cell Pack Manufacturing Equipment

- » Progressive dies
- » Blister pouch forming
- » Electrolyte dispensing
- » Cap crimping machines
- » Laminators
- » Electrolyte wetting machines
- » Slitters/rewinders
- » Conveyors
- » Robotics
- » Data collection systems
- » Pick-and-place machines
- » Thermal imaging systems
- » Cell testers



## Battery Cell Conditioning Cabinet

- » Each tray holds 4 cells; sizes from button cells to 35700 cells.
- » Cell conditioning cabinet for 4x32 Li-ion cells.
- » Cables provided for interfacing to bidirectional power supply.
- » Trays slide out for easy access; each cell is individually monitored right at the cell; voltage taps available on the cell holders.



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