Virtual Battery Seminar

12-14 January 2027

- 6 hours training



Shmuel De-Leon Energy invites you to join 6 hours battery virtual seminar taking place as 3 parts on 12-14 January 2027.

Registration to seminar - $599 per person

- **Discount registration rate for group registration - Contact us for more details.**

---

12 January 2027 - Part 1 - (3 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 1 includes 3 sections - Battery Essentials, Li-Ion Cells Data Sheet Design, Primary Batteries

13 January 2027 - Part 2 - (2 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 2 includes 2 sections - Rechargeable batteries and battery Packs Design

14 January 2027 - Part 3 - (2 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 3 includes 1 session - Battery Safety Training

* Registered attendants will receive the training presentation (Presentations are confidential for internal use only)

Training Syllabus:

Battery Essentials

- Battery History
- The strong need for batteries
- Cells & Battery Packs
- Cells classifications
- Internal cell components
- Anode and cathode structure
- Cell components affecting energy density
- Charge - Discharge operation
- Cells - Button & Coin Cells Shape
- Cells - Hard Case Cylindrical Shape
- Cells - Hard Case Prismatic Shape
- Cells - Prismatic Pouch Shape
- Batteries/Cells Standardization
- Cells - Common Size
- Cells Internal Construction - Bobbin and Spiral Types
- Li-Ion Energy Ver. Power Cell (Flat Plate Construction)

- Cells Internal Construction - Pin Type
- Cells Internal Construction - Flat Plates Type (Stacking)
- Cells Internal Construction – Flat Wound Type
- Cells Internal Construction – Z-Folding
- Cells – Internal Construction Thin Film Type
- Cells - Case Polarity, Seals
- Cell Voltage Definitions
- Internal Resistance/Impedance
- Operating Temperature – What Does it Mean?
- Storage Temperature
- Shelf Life, Cycle Life, Service/Calendar Life
- Factors Affecting Aging and State of Health
- Recommended Battery Storage Conditions
- State of Charge – State of Health
- What is a C-Rate (Apply to Charge and/or Discharge)
- Energy & Power Density

Design of Li-Ion Rechargeable cell data sheet

- Lithium rechargeable cells data sheets
- No One Way to Define Cell Data sheet
- Cell Data Sheet Validation
- Typical Data Sheets
- Cell Voltage Range - [V]
- Maximum Charging Voltage - [V]
- Maximum Open Circuit Voltage - [V]
- Standard Charge Current Rate (Slow Charging) – [A]
- Maximum Constant Current Charge Rate (Fast Charging) – [A]
- Maximum Pulse Current Charge Rate – [A]
- Standard Discharge Current Rate (Slow Discharging) – [A]
- Maximum Continues Discharge Current rate (Fast Discharging) – [A]

- Maximum Pulse Discharge Current rate (Fast Discharging) – [A]
- Safety Certifications and Status
- Cell Capacity – [Ah]
- Nominal Voltage – [V]
- Energy – [Wh]
- Weight Energy Density - [Wh/kg]
- Volumetric Energy Density –[Wh/l]
- Charge Capacity @ Temperature – [%]
- Discharge Capacity @ Temperature – [%]
- Discharge Capacity @ C-Rates – [Ah]
- Standard Cycle Life
- Fast Charge Cycle Life
- Cycle Life @ Discharge C-Rates
- Cycle Life @ Temperature
- AC Resistance (0%SOC, 25oC) – [mOhm]
- DC Resistance (50%SOC, 25oC) – [mOhm]
- Self-Discharge – [%]
- Thickness variation (0 to 100% SOC) – [%]
- Thickness variation as function of cycle life [%]
- Performance limits for BMS/PCM
- OCV vs SOC @Temperature for BMS
- Some Extra Information
- Identification and marking – Murata Example

Primary Batteries

- Primary Batteries Characteristics
- Why Still Talk About Primary Battery?
- Commercial Primary Cells Energy Density Comparison
- Zinc Chloride and Zinc Carbon- (Heavy Duty)
- Alkaline Manganese Dioxide – Zn/MnO2

- Alkaline Manganese Dioxide Cells – Bobbin Construction
- Alkaline Thin Film Flexible Batteries
- Silver Oxide (Zinc) – Zn/Ag2O
- Discharge Profile: Silver Oxide & Alkaline Button Cells
- Lithium Primary Cells
- Why Lithium?
- Theoretical Energy Densities Of Battery Chemical Couples
- Lithium Cell Advantages
- Lithium Cell Limitations
- Lithium Primary Cells Electrolyte Classification
- Lithium Passivation
- High Temperature (> 100 Deg C) Lithium Battery Applications
- Lithium Iron Disulphide Li/FeS2
- Lithium Manganese Dioxide Li/MnO2
- Thin Film Primary Batteries
- Lithium Carbon Mono Fluoride Li/CFx
- Ultralife – Li/CFx-MnO2
- Lithium Thionyl Chloride LI/SOCl2
- Lithium Sulfuryl Chloride Li/so2cl2
- High Power Lithium Organic Cell (TLM series)
- Tadiran Low TMV Lithium Thionyl Chloride Cells (TRR)

Rechargeable Batteries

- Why Rechargeable Batteries?
- Rechargeable Chemistries
- Lead Acid Batteries, Advantages, Limitations
- Industrial Lead Acid Cells
- Lead Acid Batteries Storage Conditions
- Nickel-Cadmium Batteries, Advantages, Limitations
- Nickel-Metal Hydride Batteries, Advantages, Limitations

- “Ready to Use” Nickel-Metal Hydride Batteries
- Rechargeable Lithium Batteries and systems
- Best Performance Cells
- Lithium Rechargeable Cells Electrolyte Types
- Li-Ion Hard Case Cells Advantages, Limitations,
- Hard Case Cylindrical Cells, 18650, 21700
- The Need for Larger Lithium Ion Cylindrical Cell Sizes
- Tesla 21700 Cells
- Hard Case Prismatic Cells
- Hard Case Button Cells
- Li-Ion Pouch Cells Soft Packaging, Advantages, Limitations
- Li-Ion Liquid Electrolyte Pouch Cells
- Ballooned Li-Ion Pouch Cells (Swelling - Gassing)
- Li-Ion Cylindrical Pouch cells
- Jenax Flexible Li-Ion Cells
- Li-Ion Cylindrical Cell with Silicon Nano Structure Anode
- Lithium Iron Phosphate Batteries, Advantages, Limitations
- Why LFP is Highly Safe?
- Lithium Werks LFP Batteries
- LFP as a Replacement to Lead-Acid Batteries
- Li-Ion High Voltage Cells, Advantages, Limitations
- High Power Li-Ion High Voltage Cells
- Solid State Batteries, Advantages, Limitations
- LTO Cells, Advantages, Limitations
- Lithium Dendrite During Low Temperature Charging
- Toshiba LTO Battery - SCiB
- Lithium Sulfur/Metal Rechargeable Cells
- What Prevents the Implementation of Li-Sulfur?
- Oxis Energy Li-S Cells
- Sion “Licerion” Li- Metal Cells

- Potential Break- Through Rechargeable Battery Technologies

Battery Pack Design

- Battery Packs – The Need
- Battery Pack Components
- Cells Used in a Battery Pack
- Resistance & Laser Spot Welding
- Connect: Aluminium Wire 0.4mm
- High Power Cells Connection
- Pouch Cells Connection
- PCM – Protection Circuit Modules. BMS – Battery Management Systems
- Battery Packs Internal Construction
- Battery Pack Insulation
- Potting for Adding Strength
- Geometry And Topology
- Battery Pack Enclosures
- Guide for Battery Pack Design Requirements
- Battery Pack Design Process
- Cells Selection - Requirements
- Designed Capacity
- Cell Validation Tests
- Design for Safety
- BMS Systems Topologies
- Li-Ion Battery Packs Unbalancing
- Cells Balancing
- Safety Component Validation Tests
- Battery Packs Mechanical Design
- Mechanical Validation Tests
- Battery Pack Performance Tests
- Battery Certifications

Battery Safety

Batteries have become daily use components for many applications. New growing segments like EV and Grid storage batteries extend the traditional ordinary battery applications. In the race for energy density, we shouldn't forget the safety – as an example the Samsung Galaxy Note 7 battery safety case. Unfortunately, we face daily safety events with injuries and severe damage. This tutorial focuses on portable, stationary, and automotive battery safety along the battery cycle life (acceptance, testing, assembly, use, transportation, and disposal). The training incorporates Shmuel De-Leon's and other experiences on battery safety representing over 30 years of work in the field. The motivation behind the training is to provide attendees with the knowledge needed to safely handle the batteries in their organization and to support reduction in safety events.

Topics to be covered:

- Battery Safety Hazards – Movies and examples
- Battery Safety Guidelines – recommendations on proper work with batteries (Acceptance, testing, battery pack design, use, transportation, disposal)
- What to do in case of a battery safety event - Recommendations
- Battery Safety Equipment – Check list for labs and warehouses



About Shmuel De-Leon:

Shmuel De-Leon is Founder and CEO of Shmuel De-Leon Energy, Ltd.

Shmuel is a leading international expert in the business of batteries.

Prior to founding the company, Shmuel held for over 20 years various positions as a battery, engineering and

quality control team manager. Shmuel holds BSc. in mechanical engineering from Tel-Aviv University and MBA in quality control and reliability

engineering from the Technion Institute in Haifa as well as an Electronic Technician's diploma.

Shmuel De-Leon/CEO

Shmuel De-Leon Energy, Ltd.

Mazal Arie 10, Hod-Hasharon, Israel 4536045

Tel/Fax: 972-77-5010792

Mobile: 972-52-8601517

E-Mail: shmuel@sdle.co.il

Company web site: www.sdle.co.il

Battery DataBase web site: www.batteriesdatabase.com

Signup for our weekly battery newsletter