Virtual EV and ESS High Voltage Battery Seminar, 12-15 April 2021 – 8.5 hours training

Shmuel De-Leon Energy invites you to join 8.5 hours battery virtual seminar taking place as 4 parts of 2.5/2 hours each on 12-15 April 2021

Registration to seminar 4 parts - $649 per person

Registration to Obrist Powertrain – New Li-Ion Automotive Extra High Energy Density with Revolutionary Vacuum Fixation Technology (Part 3 only) - $299 per person

Registration to Renault – EV`s Battery Validation Testing Process (Part 4 Only) - $349 per person

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12 April 2021 - Part 1 - (2.5 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 1 includes 3 sections – EV & ESS Battery Essentials, EV & ESS Li-Ion Rechargeable Cells, EV & ESS Battery Pack Design

13 April 2021 - Part 2 - (2 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 2 includes 6 sections – EV & ESS Battery Pack Mechanical Construction, EV & ESS Battery Pack Thermal Management, EV & ESS Battery Pack Validation Testing & Certifications, EV & ESS Battery Pack Recycling, EV & ESS Battery Pack Safety

14 April 2021 - Part 3 - (2 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 3 includes 1 section - Obrist Powertrain – New Li-Ion Automotive Extra High Energy Density with Revolutionary Vacuum Fixation Technology

15 April 2021 - Part 4 - (2 hours) - starting at 16:00 PM Central Europe Time, 10:00 AM EST USA Time

Part 4 includes 1 section - Renault – EV`s Battery validation testing process

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

Training Syllabus:

Battery Essentials

- The strong need for batteries
- Factors Effecting Electric Vehicle Penetration
- xEV`s Terminology
- HEV, PHEV, BEV
- Xev`s Architecture
- Energy Demand Surging
- Renewable Intermittent Energy Sources
- EV`s and the Grid Storage
- Why ESS?
- Stationery and Grid Terminology
- Cells & Battery Packs
- Cells main internal components
- Cell components effect on Energy Density
- Charge/Discharge operation
- Cells formats
- Hard Case Cylindrical Cells
- Hard Case Prismatic Cells
- End of Life, Shelf Life, Cycle Life, Service/Calendar Life
- Factors Affecting Aging and State of Health
- State of Charge – State of Health
- What is a C-Rate (Apply to Charge and/or Discharge)
- Energy & Power Density

xEV`s and ESS Li-Ion Rechargeable Cells

- 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
- Hard Case Prismatic Cells
- Hard Case Button Cells
- Li-Ion Soft Packaging Pouch Cells, Advantages, Limitations
- Ballooned Li-Ion Pouch Cells (Swelling - Gassing)
- Lithium Iron Phosphate Batteries, Advantages, Limitations
- Why LFP is Highly Safe?
- LTO Cells, Advantages, Limitations
- Lithium Dendrite During Low Temperature Charging
- Toshiba LTO Battery - SCiB
- Lithium Rechargeable Solid State Batteries – Advantages/Limitations

xEV`s and ESS Battery Pack Design

- Battery System Design
- Tesla & Nissan BEV Modular Battery Pack Design
- Battery Pack Performance Requirements
- Battery Pack Mechanical Requirements
- Battery Pack Thermal Management Specification Requirements
- Battery Pack BMS Requirements
- Battery Pack Safety Requirements
- Battery Pack Validation Testing Requirements
- High Voltage Battery Cells Selection
- Calculating Number of Cells Needed
- Calculating Pack Energy and Capacity
- Calculating Driving Range
- Calculating Final Battery Pack Energy Needed
- Calculating Battery Pack Power
- Calculating Battery Pack Voltage Range
- Design for Safety
- CID and Safety Vent

- Shut Down Separator
- Battery Pack External Safety Component Selection
- BMS Systems and Functionality
- BMS Systems Topologies
- Li-Ion Battery Packs Unbalancing
- Cells Balancing
- All Cells Technologies – Blocking Propagation Materials
- Design for Reliability and Service Life
- FMEA- Failure Modes Effects Analysis
- Lithium Batteries – Accelerated Life Testing
- Halt-Hass Process
- Design for Quality
- Computer Tools Support Battery pack Design Engineering and Analysis

xEV`s and ESS Battery Pack Mechanical Construction

- Battery Pack Mechanical Construction
- Battery Pack Modular Design
- Battery Pack Mechanical Parts

xEV`s and ESS Battery Pack Thermal Management

- Why is Battery Pack Thermal Management Important?
- Battery Pack Thermal Management Requirements
- Cooling Methods Comparison
- Fluid Immersion
- Heating for Cold Weather

xEV`s and ESS Battery Pack Validation Testing & Certifications

- Test & Validation
- Common High Voltage Battery Standards

xEV`s and ESS Battery Pack Recycling

- EV/ESS Battery Recycling
- The need for Li-Ion Battery Recycling
- Battery Recycling Benefits
- Material Content of Li-Ion Cell
- What is Needed to MAKE Recycling Practical
- 38 Companies to Recycle Li-Ion Cells in 2020
- Main Recyclers

xEV`s and ESS Battery Pack Charging Systems

- Charging Standards
- Charging Solutions
- DC Charging Versus AC Charging
- Fast Charging – The Problem and Solution

xEV`s and ESS Battery Pack Safety

- EV Batteries Safety
- EV Batteries are Different
- EV Battery Monitoring need Special Attention
- Battery Safety Failures Flow Chart
- Failure Propagation
- High Voltage Hazards
- Protection against Direct Contact
- High Voltage Hazard – Ground Fault Isolation Detection
- High Voltage Cables Color
- High Voltage Hazards – Interlock Loops
- High Voltage Hazard – Safety Equipment
- Safety labels
- A Crash Could Results in an explosive Fire
- Protection against Pack Crash

- Liquid Exposure
- Charging Safety
- On Board Battery Chargers
- Partly On-Board Battery Chargers
- EV Battery Fire Fighting Procedure
- Water as an Extinguishing agent

Obrist Powertrain – New Li-Ion Automotive Extra High Energy Density with Revolutionary Vacuum Fixation Technology – Presented by Mr. Martin Graz

- Introduction OBRIST Group
- Short Overview Hyper Hybrid Powertrain Technology
- Short Introduction Zero Vibration Generator ZVG
- Obrist Li-Ion Battery System
    - Development History
    - Battery Design (Vacuum Technology)
    - Performance Values
    - Thermal Management
    - Further Applications
    - Cost Estimation
- Patents

Renault – EV`s Battery Validation Testing Process – Presented by Mr. Mohamed-Amine Aroubate

- **Presentation of the norms and standards that batteries should respect (SAE, KMVSS, GBT, R100)**
- **The generic validation plan:**
    - *Functional tests*
    - *SW protection (Overtemperature, Overcharge and Over Discharge)*
    - *Short Circuit detection*
    - *Current leak detection*
- **Safety tests**

    - *Thermal propagation (Nail, Overcharge, Heater)*
    - *Fire Resistance*
    - *Mechanical Shock*
    - *Mechanical Integrity*
    - *External Short Circuit*
    - *Blunt road test*
    - *Partial Fluid Immersion*
- **Environmental tests**
    - *Corrosion*
    - *Vibration*
    - *Condensation*
    - *Immersion*
- **Electrical tests**
    - *Ageing tests*
    - *Characterization tests*

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.

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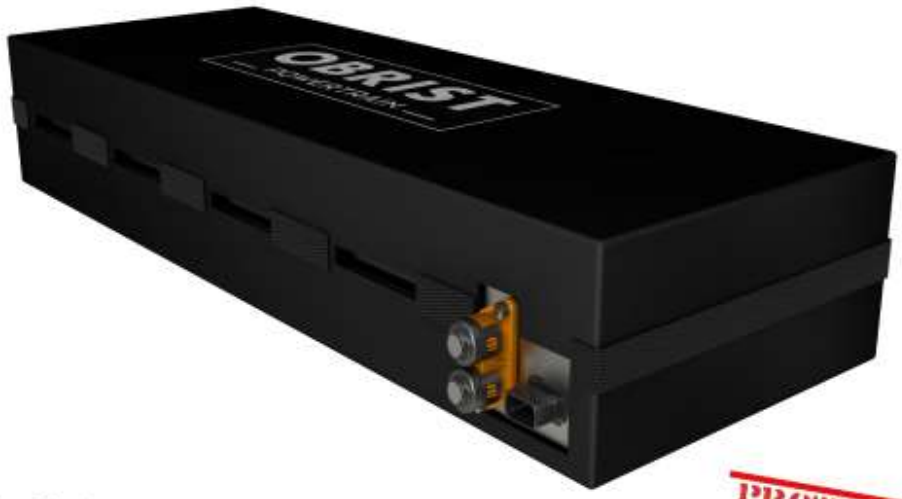
OBRIST
POWERTRAIN

New Li-Ion Extra High Energy Density Battery
with Revolutionary Vacuum Fixation Technology



PROTECTED TECHNOLOGY

Design Features

- Revolutionary Vacuum Fixation Technology that leads to:
  - low weight with extreme specific energy density values
  - low cost and flexible battery pack design (cylindrical or pouch cells)
  - efficient air cooling system
  - fewer battery pack parts for improved cost and reliability
  - improved battery pack safety due to rigid construction
  - rugged design for challenging environments (IP69k certification)
- Thermal insulation for independence from ambient conditions (extends service life)
- Battery Management System with wireless voltage sensing (improved reliability)
- Can be designed from low (48VDC) to high voltage (1200VDC)
- Universal battery that can be customized per customer demand (modular design)
- Module aluminum housing works as a temperature heat sink, eliminating internal heat exchangers

Potential Applications

- Automotive, truck, bus, heavy-duty transportation, electric aviation, marine
- PHEV, HEV, BEV

For battery prototypes and technology licensing, contact OBRIST Powertrain

WWW.OBRIST-POWERTRAIN.COM
Rheinstrasse 26-27 - 6890 Lustenau - Austria

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New Li-Ion Extra High Energy Density Battery
with Revolutionary Vacuum Fixation Technology

Technical Details PHEV (cylindrical)

- Samsung INR18650-30Q (3000mAh)
- Energy: 17.3kWh (100s16p)
- Nominal voltage: 360VDC (420V-240V)
- Continuous charge power: 26kW
- Continuous discharge power: 110kW (200kW pulse)
- Battery Dimensions: 1017 x 359 x 166mm
- Battery Weight: 98kg
- **Module energy densities: 203Wh/kg, 446Wh/l**

Technical Details BEV (cylindrical)

- LG INR18650-MJ1 (3500mAh)
- Energy: 20.2kWh (100s16p)
- Nominal voltage: 360VDC (420V-240V)
- Continuous charge power: 10.1kW
- Continuous discharge power: 60kW
- Battery Dimensions: 1017 x 359 x 166mm
- Battery Weight: 103kg
- **Module energy densities: 224Wh/kg, 520Wh/l**

Technical Details BEV (pouch)

- Customized (140Ah)
- Module Energy: 7.05kWh (14s1p)
- Module Nominal voltage: 50VDC (59V-34V)
- Continuous charge power: 3.5kW
- Continuous discharge power: 21kW
- Battery Dimensions: 559 x 2234 x 103mm
- Battery Weight: 30.5kg
- **Module energy densities: 231Wh/kg, 527Wh/l**

Vacuum Fixation Technology

Air Cooling System