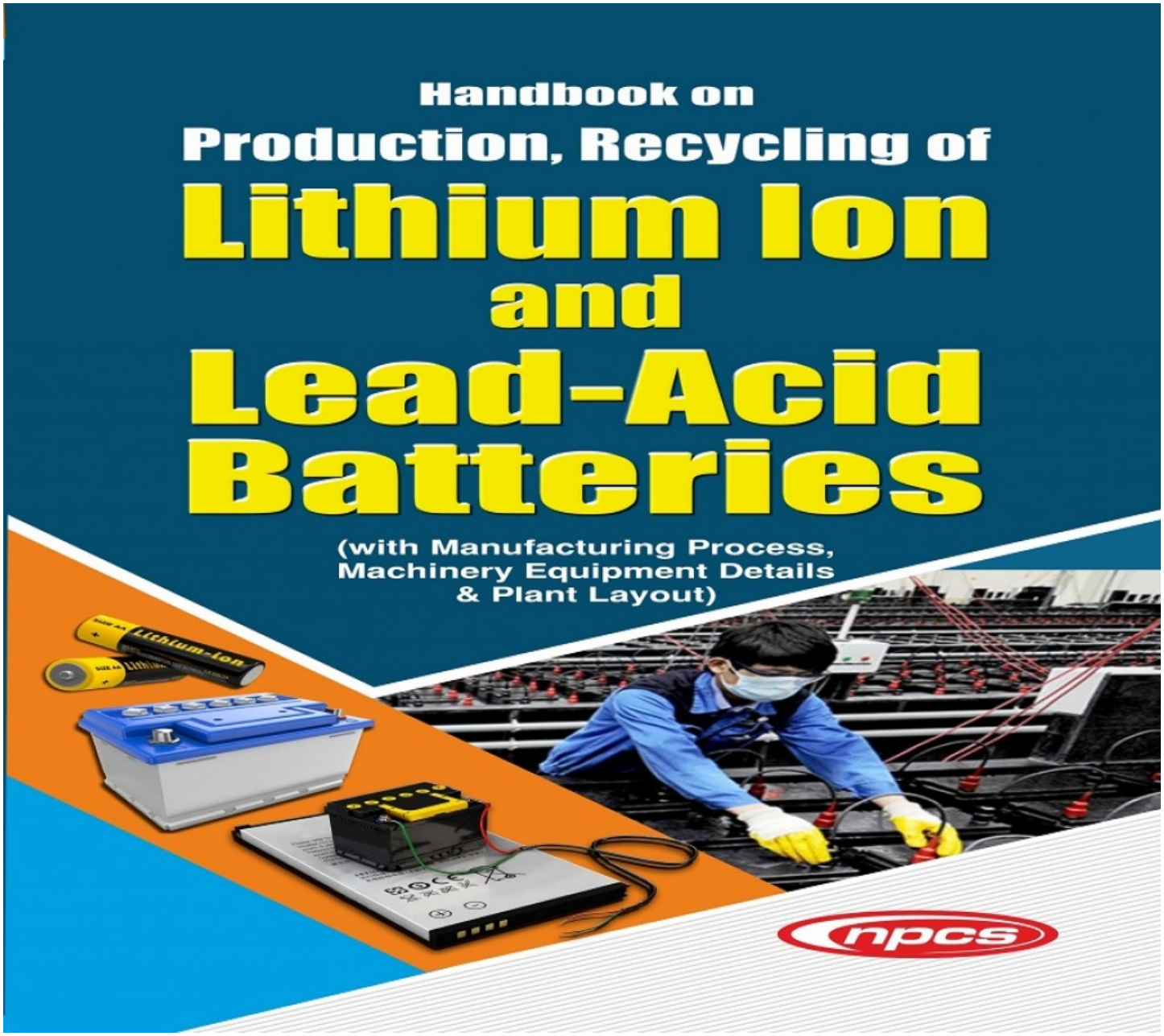
The Lithium Ion Battery Revolution: A Handbook on Production, Recycling of Lithium Ion and Lead-Acid Batteries

Handbook on Production, Recycling of Lithium Ion and Lead-Acid Batteries (with Manufacturing Process, Machinery Equipment Details & Plant Layout)



Delhi, India Jun 2, 2022 (Issuewire.com**)** - You will understand the full concept of the Battery Industry with the help of a book. To know more about lithium-ion and lead-acid batteries, there are some important aspects such as production, recycling, etc. The information mentioned in the book will be helpful for startups planning to start new manufacturing units, who want to expand their existing business areas in the lithium-ion or lead-acid battery Manufacturing or recycling industry, or who are already running either of these businesses.

This **Handbook on Production, Recycling of Lithium-Ion and Lead-Acid Batteries** *(with*

Manufacturing Process, Machinery Equipment Details & Plant Layout) provides valuable information on all necessary aspects related to lithium-ion and lead-acid battery industries that we are explaining here. So, stay tuned till the end to get the most information and details on how to buy the book.

It also includes a process flow diagram (PFD) for both types of batteries which is useful for any company which wants to set up a new plant or expand its current operations. All details like machinery equipment required, plant layout, raw materials used, etc. have been included in it so that it can be used by companies while starting up their own plants.

Apart from process flow diagrams, an overview of complete recycling processes has also been given in detail. Also, a brief history of the evolution of each type has been provided along with its present status across different countries. It will be very useful for anyone interested in knowing more about lithium-ion and lead-acid battery industries.

Indian Battery Sector

India is one of the world's largest battery manufacturers. Furthermore, there is an increase in global demand for batteries, and Indian battery producers are preparing to satisfy this need. The Indian battery sector has grown by 25% year over year and is expected to increase even more in the future. Batteries, such as Sealed Maintenance Free (SMF), lead-acid, or lithium-ion batteries, now power virtually everything else in the world.

The Future of Recycling of Batteries in India:

India, the world’s second-largest producer of electronic goods, has an estimated stockpile of about 500 million lithium-ion and lead-acid batteries that are discarded annually. Despite the existence of stringent laws to promote and encourage battery recycling in India, less than 5% of all discarded batteries are being recycled currently. A large percentage of these recyclable batteries are ending up in landfills due to the lack of proper collection and recycling facilities across the country.

Recycling batteries should be a major priority in India, given the country’s growing e-waste problem and the fact that consumers have been slow to adapt to new battery technologies such as lithium-ion batteries.

Future of recycling of Lithium-Ion Battery in India:

In the coming years, India's commitment to the shift from fossil fuel-based vehicles to electric vehicles (EVs) will dramatically raise the demand for batteries. Among the several extant battery technologies, the lithium-ion battery (LiB) is now the most suited alternative.

Although there are many different types of LiB batteries, the majority of electric vehicles use lithium nickel manganese cobalt (LNMC) and lithium iron phosphate (LFP) batteries. These batteries have a shelf life of eight to ten years, but once their energy-generating capability falls below 80%, they are no longer suitable for electric vehicles. These batteries, on the other hand, can still be employed in stationary applications such as renewable energy storage and other stationary applications.

In India, roughly 0.4 GWh LiBs were available for recycling in 2020, according to reports. By 2030, it is predicted that the total volume of retired LiBs (straight from EVs and after second-use applications) would be roughly 70 GWh. With proper recycling treatment, around 90% of these can be recovered.

Valuable metals like cobalt, nickel, manganese, lithium, graphite, and aluminum can be recovered up to 90% with current recycling technology. These account for roughly 50-60% of the entire battery cost, with cobalt being the most costly.

Some topics covered in this handbook:-

- Introduction

1.1. Principles of Operation

1.2. Primary Batteries

1.2.1. Zinc–Manganese Dioxide Systems

1.2.2. Zinc–Mercuric Oxide Battery

1.2.3. Zinc–Silver Oxide Battery

1.2.4. Lithium Batteries

1.2.5. Air-Depolarized Batteries

1.2.6. Other Primary Battery Systems

1.2.7. Storage Batteries

1.2.8. Lead-Acid Batteries

1.2.9. Alkaline Storage Batteries

1.2.10. Lithium Storage Batteries

1.3. Development of Batteries

- Battery Design and Function

2.1. Lithium-Ion Battery Electrochemistry and Function

7.12. Marine and Maritime Applications

7.13. Grid and Stationary Applications

7.14. Bulk Energy Storage

7.15. Ancillary Services

7.16. Transmission and Distribution Infrastructure Services

7.17. Customer Energy Management Services

7.18. Community Energy Storage

7.19. Aerospace Applications

- Lithium Battery Manufacturing

8.1 Electrode Coating

8.2. Cell Assembly

8.2.1. Prismatic Cells

8.2.2. Cylindrical Cells

8.3. Formation

8.4. Process Control

8.5. Support Services

8.6. Lithium-ion Battery Pack Assembly Line Making Machine

8.6.1. Battery Cell Tester

8.6.2. Auto Paper Pasting Machine

8.6.3. Auto Sorting Machine

8.6.4. Spot Welding Machine

8.6.5. Integrated Tester

8.6.6. Charging Discharging Aging Machine

- Recycling of Lithium-Ion Batteries

9.1. Repairing and Remanufacturing

9.2. Refurbishing, Repurposing, and Second Life

9.3. Second Life Partnerships

9.4. Recycling

9.5. Manufacturing Process

9.6. Manufacturing Equipments

9.6.1. Filter Press–Removal of the Black Mass

9.6.2. Filter Press–Removal of the Lithium Carbonate

9.6.3. Features

9.7. Evaporation and Heated Tank System

9.8. Clarifier

9.8.1 Features

9.9. Sludge Dryer

9.9.1. Features and Benefits

9.10. Thermal Evaporators

9.10.1. Benefits of Evaporators

9.11. Reverse Osmosis (RO)

9.11.1. Applications

9.12. Ultrafiltration

9.12.1. Attributes

9.13. Atmospheric Evaporators

- Aluminum–Air Battery

10.1. Electrochemistry

10.2. Materials and Methods

10.2.1. Materials

10.2.2. Hydrogen Evolution and Half-Cell Test

10.2.3. Full-Cell Test

10.3. Results and Discussion

10.4. Aluminium-Air Battery: Discovery, Commercial Alloys, and State of The Art

10.5. Discovery and Production

10.6.Commercial Aluminium Alloys

- Alkaline Battery

11.1. Electro-Chemical Description

11.2. Temperature Effects on Performance

11.3. Voltage and Capacity

11.4. Discharge Types

11.5. Shelf Life

11.6. The Shelf Life is influenced by Temperature,

Humidity and Internal Construction

11.7. Testing / Care / Warnings

11.7.1. Testing

11.7.2. Warnings

11.8. Current

- **Lead-Acid Battery Manufacturing**

Equipment

16.4. Lead Battery Recycling Plant

16.4.1. Scope

16.5 Manufacturing Equipment:

16.5.1. Battery Cutting Machines / Battery Breakers

16.5.2. Rotary Furnace

16.5.3. Pollution Control Plant

16.5.4. Refining and Alloying Pots

16.5.5. Ingoting Systems

- **Zinc-carbon battery**

17.1. General Characteristics

17.2. Chemistry

17.3. Types of Cells and Batteries

17.3.1. Leclanche´ Batteries

17.3.2. Zinc Chloride Batteries

17.4. Construction

17.4.1. Cylindrical Configuration

17.4.2. Inside Out Cylindrical Construction

17.4.3. Flat Cell and Battery

17.4.4 Special Designs

17.5. Cell Components

17.5.1. Zinc

17.5.2. Bobbin

17.5.3. Manganese Dioxide (MnO2)

- Environmental Issues for Batteries

18.1. Lifecycle Analysis (LCA)

18.2. Material Issues

18.2.1. Resource Availability

18.3. Environmental Impacts

18.3.1. Electrode Materials

18.3.2. Electrolyte Risks

18.3.3. Binders

18.4. Material Issues: Going Forwards

18.4.1. Energy Density

18.4.2. Alternative Materials

18.4.3. Non-Fluorinated Binders

18.4.4. Cobalt Substitution

18.5. Energy Issues: Production and Charging

18.5.1. Source Of Energy for Production

18.5.2. Roundtrip Efficiency

18.6. Lifespan

18.7. End-of-Life (EoL) treatment

18.7.1. Recycling

18.7.2. Re-Use

18.7.3. Design for Recycling and Re-Use

- International Standards and

Testing Applicable to Batteries

Standards and Safety Testing Organisations

General Battery Standards

Lithium Battery Standards

Nickel Metal Hydride Battery Standards

Nickel Cadmium Battery Standards

Lead Acid Battery Standards

Photovoltaic Battery Standards

Safety Standards

Automotive Battery Standards

Aircraft Battery Standards

Military Standards for Batteries, Software,

EMC/RFI, Safety & Quality

Radio Battery Standards

Standby Power Systems Standards

Software Standards

EMC/RFI Standards

Ingress Protection (IP) Standards

Battery Monitoring Standards

Battery Recycling and Disposal Standards

Other Related Electrical Standards

Quality Standards

- BIS Specifications
- Plant Layout and Process Flow Chart

& Diagram

- Automated Manufacturing Equipment

22.1. Equipment Specifications

22.2. Kaido Winder

22.3. Hibar Equipment

22.3.1. Module 1: Bottom Tab Welding System

22.3.2. Module 2: Beading/Grooving System

22.3.3. Module 3: Sealant Dispensing System

22.3.4. Module 4: Electrolyte Filling System

22.3.5. Module 5: Top Tab Welding and Taping System

22.3.6. Module 6: Final Crimping System

22.4. Formation and Test Equipment

22.5. Machine Vision Approach and Implementation

22.5.1. Part Serial Number / Bar Code Tracking

22.6. Manufacturing Equipment Installation

22.7. Operator Training

22.8. Manufacturing Equipment Validation

22.8.1. Kaido Winder Validation

22.8.2. Hibar Resistance Welding Module Validation

22.8.3. Hibar Beading Module Validation

22.8.4. Hibar Sealant Dispensing Module Validation

22.8.5. Hibar Electrolyte Filling Module Validation

22.8.6. Hibar Electrolyte Filling System Performance Validation

22.8.7. Hibar Top Tab Welding and Taping Module Validation

22.8.8. Hibar Crimping System Validation

- Photographs of PLANT & Machinery with

Supplier's Contact Details

Lead Battery Recycling Plant

Battery Automatic Plate Pasting Machine

Lead Battery Recycling Plant

Lithium-Ion Battery Machine

Lithium-Ion Battery Tester

Vacuum Oven

Vacuum Drying Oven for Lithium-Ion Battery

Planetary Mixer Vacuum Jacketed

Battery Inter-cell Welding Machine

Automatic Battery Assembling Plant

Battery Breaking and Separation Ds Systems

Electrode Coating Machine

Battery Plate Enveloping Machine

Lead Battery Breaking Plant

Battery Cutting Machine

Battery Cell Spot Welding Machine

Semi-Auto Grooving Machine for Cylindrical Cell

Battery Heat Sealing Machine

Battery Laser Welding Machine

Electric Battery Lead Melting Furnace

The global battery market was worth USD 108.4 billion and is predicted to increase at a CAGR of 14.1%. The increasing demand for automotive applications is responsible for the market's rise. The rising global popularity of consumer electronics is expected to increase the use of lithium-ion batteries as a product category.

Portable electronics, such as LCD displays, smartphones, tablets, and wearable devices like fitness bands, are in high demand, increasing market growth. Because of technical developments in terms of increased efficiency, cost-effectiveness, and product innovation, the market is predicted to rise significantly. Battery demand is likely to be driven by strict emission requirements imposed by government agencies in industrialized countries such as the United States and the United Kingdom, as well as an increasing focus on fuel efficiency.

The Demand for Lithium-Ion batteries is predicted to increase by more than 500 percent in the future. Many predictions suggest that demand will outpace supply, virtually assuring a price increase. All of the businesses in this field have unique opportunities to invest in the future of energy storage and transportation.

The global lithium-ion battery market size was valued at USD 53.6 billion and is expected to grow at a compound annual growth rate (CAGR) of 19.0%. The market's expansion can be ascribed to the rising demand for lithium-ion batteries in electric vehicles (EVs) and grid storage since they provide high-energy density and lightweight solutions. The market size is expected to grow due to an increase in the registration of electric vehicles.

Lead–Acid Battery Demand

The global lead-acid battery industry is growing significantly across the globe and it is likely to register a CAGR of 5.2% during the forecast period. Growing SLI applications in the automobile sector, an increase in renewable energy output, and rising demand for energy storage devices are some of the causes driving up demand for lead-acid batteries.

As the telecom industry expands in nations like the United States, Brazil, India, and the United Kingdom, there is a growing demand for UPS systems as a backup power source, resulting in higher usage of lead-acid batteries as a cost-effective energy source.

Conclusion:

The book covers a wide range of topics connected to Batteries, as well as their manufacturing processes. It also includes contact information for machinery suppliers, as well as images of equipment.

A complete guide on Production, Recycling of Lithium-Ion and Lead-Acid Batteries manufacture and entrepreneurship. This book serves as a one-stop-shop for everything you need to know about the battery manufacturing industry, which is ripe with opportunities for manufacturers, merchants, and entrepreneurs. This is the only book that covers the Production, Recycling of Lithium-Ion and Lead-Acid Batteries in depth. From concept through equipment procurement, it is a veritable feast of how-to information.

So, order it now before it goes out of stock.

About Niir Project Consultancy Services (NPCS)

NPCS provides reliable consultancy services worldwide and has been excelling in its expertise in a wide range of services. NPCS also published a monthly magazine Entrepreneur India since 1995. Which is widely read by Entrepreneurs, businessmen, etc. The services include investment opportunities, technology transfers, pre-feasibility study, business plan, new project identification, project feasibility, identification of profitable industrial project opportunities, thorough analysis of the project, plan of all resources & details on capital and operational costs, economic feasibility study of the project, profile analysis, preparation of project profiles / pre-investment studies, market surveys/studies, preparation of techno-economic feasibility reports, funding analysis, market potential study, identification and section of plant /process/equipment, general guidance, technical and commercial counseling for setting up new business.

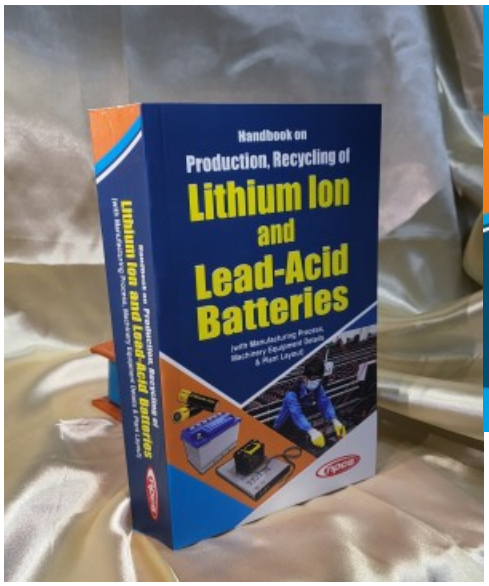
Media Contact:

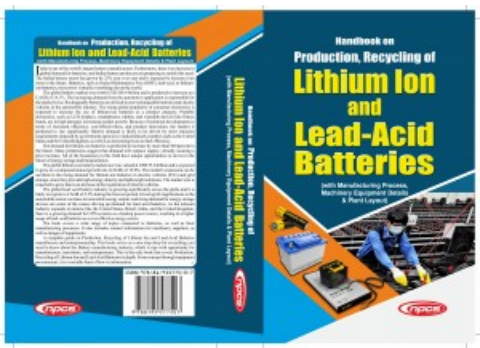
Ajay Gupta

+91 8800733955

info@entrepreneurindia.co

https://www.niir.org/





Media Contact

Ajay kumar Gupta

akgupta@niir.org

09097075054

NIIR PROJECT CONSULTANCY SERVICES, 106-E KAMLA NAGAR, DELHI

Source : NIIR PROJECT CONSULTANCY SERVICES

See on IssueWire