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BATTERY DIRECTORY & YEAR BOOK



FORTNIGHTLY ISSUE

16-31 August 2026

(Vol.41, No.16 Published on 14.08.2026)

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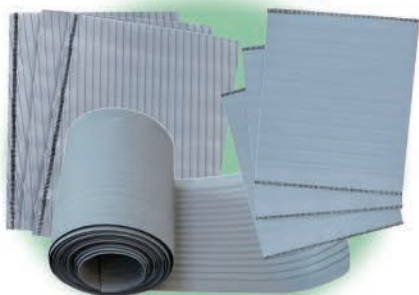


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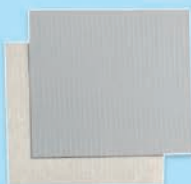
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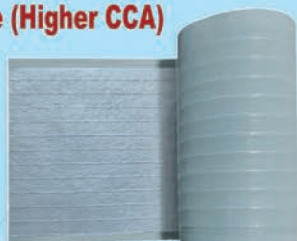


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'LA-POWER' Technologies provides not just only consultancy, it works as a complete project. So it is lengthy & consumes time to formulate effective solution that you have never seen before. It has a high class operational working system. Before it you know consultancy that a consultant visit out your factory & provides some tips & you have to do all arrangement & practical in his absence. So how you can satisfy?

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- Tubular Batteries (Flooded)
- Solar Batteries (VRLA)
- Electrical Vehicle Batteries (Flooded & VRLA)
- Telecom/Railways Batteries (VRLA)
- Defence Batteries (Flooded)
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 - b. Each section complete training for a lay-man to managers
 - c. Chemist training as step-by-step, A to Z section testing
 - d. Machineries/equipments handling, calibration & trouble shootings etc
- **Documentation:**
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 - b. Documentation for ISO certification
 - c. Charts/boards/indicators etc for best management system

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Knowledge without devotion to God produces hatred.

—Bhagwan Sh. Sathya Sai Baba



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Many Battery Associations from across the country joined the summit.

'The Green Grid Summit-2026' Concludes in Udaipur

Deliberations by experts from the battery, lead, lithium, solar, and energy storage sectors

When various organizations unite for a common goal, collective collaboration paves the way for true success.

'PowerOn – The Green Grid Summit-2026,' held in Udaipur, stood as a prime example of this unified effort. The event's unprecedented success was made possible through the active collaboration and joint endeavors of the RSBTA (Rajasthan Storage Battery and Traders Association), GSSBA (Gujarat Small-Scale Battery Association), MP Battery Association, Kota Battery Association, and Udaipur Battery Trade Association. The dedication of these key state-level and regional associations has paved a new path to integrate the country's MSME battery manufacturers into the global value chain by connecting them with modern technologies, BESS (Battery Energy Storage Systems), and e-mobility.

August 8th marked the dawn of the small-scale battery industry in Udaipur! This historic day heralded a new era for Indian small-scale battery manufacturers with the hosting of **'Power On – The Green Grid Summit 2026.'** This significant milestone was achieved because the summit went beyond the confines of traditional assembly processes, directly connecting small-scale manufacturers with cutting-edge technologies such as BESS (Battery Energy Storage Systems),

nanomaterials, and e-mobility. For the first time, scientists, policymakers, and regional associations from both India and abroad came together on a single platform to provide a clear roadmap for integrating MSME units into the global supply chain and the sustainable energy storage ecosystem.

BESS – The New Market for Energy Storage

In-depth discussions at the conference made it abundantly clear



Shri Satish Sharma welcoming the Federation President, Shri Harashpal Singh Sawhney



Shri Poonamchand Kachhawah and Shri Lokesh Kumar Tikkiwal welcoming the Federation's General Secretary, Shri Naresh Tomar.

that Battery Energy Storage Systems (BESS) are poised to become a market of immense and limitless potential for the Indian battery industry. The Central Government's ambitious 'Free Electricity for Every Home' scheme (Solar Rooftop Scheme) is now expanding beyond mere on-grid systems to include the option of integrating on-site battery storage.

Although the government is prioritizing lithium-ion batteries under this scheme, the Federation of Indian Small Scale Battery Associations (FISSBA) is working on a concrete, two-pronged strategy regarding this matter:

1. Technical Modernization:

Enhancing the cycle life and efficiency of traditional lead-acid batteries to levels comparable to lithium-ion batteries by incorporating nano-carbon additives, gel technology, advanced spine alloys,

and voltage-balancing electronics (BMS).

2. Policy Advocacy: Advocating before the Central Government and the Ministry of New and Renewable Energy (MNRE) to ensure consumers have complete freedom to choose any certified battery technology (lead-acid or lithium) based on their budget, safety requirements, and utility needs; this would safeguard the interests of the country's millions of small-scale MSME manufacturing units and boost local employment.

The event was inaugurated in the presence of **Federation of Indian Small Scale Battery Associations President Shri Harashpal Singh Sawhney; Rajasthan Storage Battery Trade Association President Shri Satish Sharma; Gujarat Small**

The energy sector is undergoing rapid transformation. In this context, it is essential for the industry to not only adopt new technologies but also understand the requirements and potential of the global market.

The Point





Federation office bearers welcoming Shri Vikas Gupta, President, and Shri Harsh Kachhwaha, Secretary, of the Jodhpur Association.



Federation office bearers welcoming Shri Basant Jain, President, and Shri Mahesh Gadiya, Vice President, of the Udaipur Battery Association.

Scale Battery Association President Shri Pradeep Suji; Madhya Pradesh Lead and Battery Association President Shri Mukesh Maheshwari; Udaipur Battery Trade Association President Shri Basant Jain; Kota Battery Association Patron Shri Ravi Nakra; Western Rajasthan Battery and Inverter Traders Association (Jodhpur) President Shri Vikash Gupta; and Shri Naveen Sharma of Gravita India Limited. The inaugural ceremony was conducted by Federation General Secretary and former Hapur BJP President **Shri Naresh Tomar**, along with **Federation North Zone Secretary Shri Poonamchand Kachhawah.**

Experts & Entrepreneurs Participated

Experts, businesspeople, and entrepreneurs associated with the battery, lead, lithium, solar, and energy storage sectors participated in this grand event and deliberated on significant topics.

The summit featured detailed discussions on topics such as the changing energy market, new

technologies, the growing need for energy storage, and integrating small and medium-sized enterprises into global value chains. Experts briefed business professionals on new technologies, market trends, and emerging opportunities in the energy sector.

The technical seminar was conducted by **Shri Ramesh Natarajan**. During the event, **Dr. N. Sugumaran**, **Dr. Sundar Mayavan**, **Dr. Akshay Jain**, **Dr. Madhusudan Adhikari**, **Shri Dinesh Rawal**, **Shri Amraj B.K.**, **Shri Anjal Niraula**, **Shri Naveen Sharma**, and **Shri Aditya Mahawar** shared their insights on the technological shifts occurring in the battery and energy storage sectors, the potential of the lithium and solar industries, and environmentally safe waste management.

Challenges Associated with Lead and Lithium

The seminar presentations began with **Dr. N. Sugumaran**, who shared his insights on the topic, **"Challenges Facing Lead and Lithium in BESS within the Indian Context."** The



Mrs. Rama Malhotra of Udaipur Electric Works Honored with the Legend Award

Udaipur Electric Works was established in 1950 by the late Shri Ram Prakash Malhotra. Following her husband's passing, Mrs. Rama Malhotra joined the firm in 1980. She led and managed the business for approximately 46 years. This honor recognizes the spirit with which she shouldered responsibilities during challenging times, the leadership with which she upheld the legacy, and the vision that paved the way for future generations' success. Her firm dealt in products such as batteries, battery plates, PVC separators, SF battery distributorships, Microtek batteries, Exide batteries, UPS systems, and battery chargers. Her son, Sachin Malhotra, also joined the business in 1992.

session addressed the difficulties involved in deploying lead-acid and lithium-based Battery Energy Storage Systems (BESS) in India. He also discussed factors such as heat, dust, grid fluctuations, safety, recycling, cost pressures, charging methods, supply chain constraints, and the need for standards tailored to the local operating environment.



Selection, Performance, Reliability, and Safety

Dr. Sundar Mayavan delivered a presentation on the topic 'Understanding Lead-Acid and Lithium-Ion Batteries

(Across Applications: Selection, Performance, Reliability, and Safety).' He explained how lead-acid and lithium-ion batteries are selected for automotive, industrial, renewable energy, backup power, and mobility



Shri Harvinder Singh Saluja of Sardar Battery Service, Udaipur—established in 1965 and a recipient of the Legend Award.

applications. The presentation also compared aspects such as performance, lifecycle, reliability, maintenance, cost, thermal behavior, safety practices, and suitability for various operating conditions and user requirements.

Advanced Nanomaterials

Dr. Akshay Jain shared his insights on the topic 'Advanced Nanomaterials for Next-Generation Batteries: BESS and Mobility.' He discussed the current landscape and future trajectory of carbon material innovation in battery storage technology. He also apprised battery entrepreneurs of key chemistries—such as lithium-ion and lead-acid—and their performance limitations, while highlighting the role of nanomaterial engineering in enhancing efficiency. He explained that the use of nanocarbon could boost battery charging capacity by up to 30%, resulting in faster charging and an extended battery lifespan.

BESS in Nepal

At the seminar, **Dr. Madhusudan Adhikari—formerly a Commissioner at Nepal's Electricity Regulatory Commission—shared his insights on the topic 'BESS in Nepal: Scope and Framework for Promotion.'** He addressed the following points: technical compliance and grid connectivity; commercial and tariff principles; decommissioning, environmental management, and battery waste; ancillary services and future market



Speakers of Summit



Dr. N. Sugumaran



Dr. Sundar Mayavan



Dr. Akshay Jain



Dr. Madhusudan
Adhikari



Shri Dinesh Rawal



Shri Amraj B.K.



Shri Anjal Niraula



Shri Naveen Sharma



Shri Aditya Mahwar

development; and monitoring, review, and penalties. Shri Dinesh Rawal, Shri Amraj B.K., and Shri Anjal Niraula from Nepal also delivered their respective presentations.

Issues with the EPR Battery Portal

At the seminar, EPR expert **Shri Aditya Mahwar** discussed the topic of 'Operational and Technical Issues with the EPR Battery Portal.' He addressed the common challenges faced by battery entrepreneurs while using the portal, covering issues such as credit generation and transfer, data entry errors, and challenges related to portal navigation.

During the Q&A session following the presentation, **Shri Naveen Sharma** and **Shri Aditya Mahwar** from Gravita India jointly addressed various issues related to

EPR and provided solutions.

The speakers noted that the energy sector is undergoing rapid transformation. In this context, it is essential for the industry to not only adopt new technologies but also understand the requirements and opportunities of the global market.

Honoured with the Legend Award

During the event, **Mrs. Rama Malhotra** and **Shri Harvinder Singh Saluja** were honoured with the Legend Award by the Federation of Indian Small Scale Battery Associations.

An evening party was hosted by the Rajasthan Storage Battery Trade Association, Gravita India Ltd. (Jaipur), and Cancrie Pvt. Ltd. (Jaipur). The seminar was supported by the Ministry of MSME. 



Address by the Federation
President at The Green Grid
Summit-2026

Small Scale Battery Industry: A Major Force for Green Energy

– Harashpal Singh Sawhney –

*President, Federation of Indian Small Scale Battery
Associations*

Today, we stand together at a major turning point for the battery industry. Friends, the world is changing rapidly, and the future of energy is evolving even faster. Everyone is talking about clean energy, electric vehicles, and sustainable power. But a simple question remains: who will drive this transformation forward? The answer is—we will: the small-scale battery manufacturers, technology providers, recyclers, and traders present in this room.

For decades, small-scale industries have been the backbone of India's power sector. We keep the lights on in small towns. We power homes, factories, and vehicles. We are the true driving force of this ecosystem.

Let us discuss our three key challenges and opportunities.

Today, as we step into the era of the green grid, we face three major responsibilities:

1. Innovation: We must upgrade our manufacturing capabilities. We

need to master both traditional lead-acid technology and modern lithium technology.

2. Sustainability: Green energy cannot be achieved through polluting methods. Recycling and Extended Producer Responsibility (EPR) are not merely regulations; they represent our commitment to the planet.

3. Fair Policy: FISSBA will steadfastly ensure that tax regulations, GST rates, and government policies protect and promote small businesses rather than stifling them.

We cannot do it alone

Major corporate brands, small enterprises, state associations, and global tech leaders—we must work as a united force.

When FISSBA speaks, the nation listens. When small-scale manufacturers unite, the market takes notice.

Let this summit in Udaipur not be limited to mere speeches; let it be about real solutions. Share your insights.



The Green Grid Summit-2026 held in Udaipur

Connect with partners. Ask tough questions. Let us build strong business relationships today.

I am proud to stand here as your President. I assure you that FISSBA will always safeguard your interests and lead you toward this green future.

I would like to extend a special thank you to our host association—the Rajasthan Storage Battery Trade Association—as well as our partner associations: the Gujarat Small-Scale Battery Association, the MP Lead and

Battery Association, the Kota Battery Association, and the association of our host city, the Udaipur Battery Traders Association, for their magnificent hospitality. I also thank all the national delegates and our international friends who have traveled from afar to join us today.

Thank you once again for being here. Let us join hands to strengthen the green grid!

Jai Hind. Thank you very much!



There is a simple question: who will drive this change forward? The answer is—we, the small-scale battery manufacturers, technology providers, recyclers, and traders present in this room.

The Point





Federation Executive Committee Meeting: General Secretary, President, and Treasurer

To strengthen the future of the battery and SME sectors

Federation's Governing Body meeting concludes in Udaipur

The Federation of Indian Small Scale Battery Associations (FISSBA) plays a pivotal role in representing the interests of Small and Medium Enterprises (SMEs) operating in the battery, energy storage, and allied sectors. In light of the rapidly evolving business landscape, technological advancements, and changing government regulations, the Federation has engaged in collective discussions on several critical issues.

The agenda for the federation's recent meeting highlighted several key issues, including regulatory changes, the Extended Producer Responsibility (EPR) framework, battery chemistry neutrality, legal preparedness, government support for MSMEs, and the future role of SMEs in the evolving

business landscape.

EPR Issue and Regulatory Changes

One of the key matters requiring attention is the ongoing legal proceeding in the Delhi High Court regarding EPR, which involves the Central Pollution Control Board (CPCB). The federation intends to review the progress of this case and assess future developments to effectively represent the industry's interests.

Mandating Lithium Batteries for E-Rickshaws

Another significant issue relates to the Ministry of Road Transport and Highways (MoRTH) draft notification dated July 22, 2025, which proposes



making the use of lithium batteries mandatory in e-rickshaws starting April 1, 2027.

This proposed requirement has sparked considerable discussion within the battery and electric mobility industries. The Federation believes that regulations affecting battery technology should take into account technical suitability, safety, cost, availability, customer needs, and the adaptability of Indian manufacturers and MSMEs.

Instead of mandating a specific battery chemistry, the industry has emphasized the importance of a technology-neutral approach, where batteries are evaluated based on safety, performance, reliability, compliance with environmental regulations, and applicable standards.

FISSBA's Representation Before Government Bodies

Following the issuance of the draft notification, FISSBA extensively

presented its position to various stakeholders. Its President, Shri Harpal Singh Sahni, engaged in discussions with nine ministries, sixteen government committees and agencies, and fifteen trade bodies.

The objective of these efforts was to highlight the industry's concerns and advocate for a balanced, technology-neutral regulatory framework regarding battery usage.

Such initiatives underscore the importance of constructive dialogue between industry associations and policymakers. MSMEs often face greater challenges in adapting to sudden regulatory changes due to limitations in access to finance, technology, infrastructure, and information.

Need for Legal and Financial Preparation

The meeting also acknowledged the possibility that legal action might become necessary if the industry's concerns are not adequately addressed.

Therefore, the Federation needs to assess the financial and budgetary requirements associated with any potential future legal action.

A well-planned approach will enable the Federation to respond effectively while ensuring that available resources are utilized responsibly in the collective interest of its members.

Learning from International Exposure and Global Developments

The visit by the Federation's delegation to the expo organized by the Thailand Energy Storage Technology Association in Bangkok (March 25–27, 2026) represents another significant aspect of the industry's growth.

International exhibitions and industry forums offer excellent opportunities to understand global trends in energy storage, battery technology, recycling, manufacturing, and electric mobility. The report on the delegation's visit, presented by Shri Hansraj Agarwal, can assist members in understanding new technologies and identifying opportunities for collaboration and business expansion.

For Indian SMEs, international exposure can also contribute to technology adoption, networking, market expansion, and knowledge sharing.

The Future of SMEs in the Current Business Landscape

The future of SMEs in the battery and allied sectors will depend on their ability to adapt to technological

shifts, regulatory requirements, environmental responsibilities, and rising competition.

SMEs need to place greater emphasis on modernization, quality improvement, skilled manpower, digital transformation, energy efficiency, financial management, and regulatory compliance.

Additionally, industry associations like FISSBA can act as a bridge between businesses and government officials.

A strong federation can provide a common platform where SMEs can voice their concerns, participate in policy discussions, access industry insights, and collaborate to address shared challenges.

Government Support for MSME Units

Government support is another crucial factor in ensuring the competitiveness and sustainability of MSME units. Financial assistance, technology upgrade programs, credit facilities, skill development, infrastructure support, export assistance, and simplified compliance processes can significantly strengthen the MSME sector.

Members should stay informed about government schemes and make effective use of available support programs. Additionally, industry associations can play a constructive role by highlighting the practical challenges faced by MSMEs and suggesting improvements to existing policies.

A Collective Approach to Sustainable Growth

Businesses cannot address the

challenges facing the battery and energy-storage industry in isolation. This requires collaboration among manufacturers, recyclers, traders, technology providers, industry associations, government officials, and other stakeholders.

FISSBA's agenda reflects this broader objective. From regulatory representation and legal preparedness to international exposure and MSME development, the Federation's priorities are deeply aligned with the industry's long-term growth.

The battery and energy storage sector is undergoing a major transformation. Regulatory changes, the growth of electric mobility, advancements in battery technology, environmental responsibilities, and rising global competition are creating both challenges and opportunities for Indian SMEs.

FISSBA's continuous engagement with government officials, trade bodies, committees, and international organizations can help ensure that the interests of MSMEs are effectively represented. A balanced, technology-neutral, practical, and industry-oriented policy framework will be essential to help Indian SMEs grow while contributing to India's ambitious goals in clean mobility, energy storage, recycling, and sustainable industrial development.

Therefore, the way forward should be based on collective representation, constructive dialogue, technology neutrality, legal preparedness, and continuous support for MSMEs. Through the concerted efforts of the industry and the government, India's battery and allied sectors can build a robust, more competitive, and sustainable future. □



Federation Executive Committee Meeting



Kota Battery Association's Contribution

to Making the Green Energy Summit a Success

To ensure the success of the International Battery Conference and Green Energy Summit scheduled for August 8 in Udaipur, the Kota Battery Association held an executive committee meeting at the Park Horizon Hotel, Kota, on July 19, 2026.

The meeting was presided over by Shri Arvind Mohan, Treasurer of the Federation of Indian Small-Scale Battery Associations (FISSBA). Shri Satish Sharma, President of the Rajasthan Storage Battery Trade Association (RSBTA), and Shri Poonam Chand Kachhawa, General Secretary (North Zone) of the Federation, also attended the meeting as special guests.

The primary agenda of the meeting was to ensure the success of the International Battery Conference and Green Energy Summit, scheduled to be held on August 8, 2026, at the Rami Royal Resort & Spa in Udaipur. Providing detailed information about the conference, Shri Arvind Mohan stated that industrialists, experts, and representatives from across the country—representing the lead, lithium, and sodium battery sectors, as well as BESS, solar, and electric vehicle industries—would participate in the event. He urged all members of the Kota Battery Association to participate in the conference in large numbers.

The meeting was addressed by Shri Poonam Chand Kachhawa (General Secretary, North Zone of the Federation), Shri Satish Sharma (President, RSBTA), Shri Jinendra Kumar Jain, Shri Sunil Bafna, Shri Ravi Nakra (Founding President), and Shri Salim Abbasi (President, Kota Battery Association). The speakers shared their views on the challenges facing the battery industry, new business opportunities, and the need for united action to foster the industry's growth.

Founding President Shri Ravi Nakra concluded the meeting by expressing gratitude to all the guests and members of the Kota Battery Association. ☐

Standard Operating Procedures (SOPs)

The Foundation of Consistent Quality for Lead-Acid Battery Manufacturers

– Ramesh Natarajan –

Mobile: 9822034407



Every successful manufacturing organization, irrespective of the industry, relies on one fundamental principle — consistency.

Consistency in processes leads to consistency in quality, productivity, safety, and customer satisfaction. The backbone of this consistency is the “Standard Operating Procedure (SOP).”

An SOP is far more than a document kept in a file or displayed on the shop floor. It is a repository of years of experience, technical expertise, experimental findings, customer feedback, and lessons learned from failures. Every step incorporated into an SOP has a purpose, even if that purpose is not immediately obvious to the operator.

Unfortunately, one of the most common challenges faced in manufacturing industries is “non-compliance with SOPs”.

Experience — An Asset or Sometimes a Liability?

In my four decades of experience in the lead-acid battery industry, I have observed an interesting trend.

Employees who have worked for many years in production often become extremely confident about their abilities.

While experience is undoubtedly valuable, overconfidence can gradually lead to complacency.

Such employees may begin to think:

▼ I’ve been doing this for twenty years

▼ Nothing will happen if I skip this step

▼ This method is faster

▼ I know a better way than what is written

Initially, these may appear to be harmless shortcuts. However, over time, these small deviations become routine practices. Gradually, the actual process followed on the shop floor bears little resemblance to the approved SOP.

Unfortunately, the consequences usually become visible only after defective products reach customers or warranty claims begin to increase.

Small Deviations Can Have Large Consequences

Manufacturing processes are highly interconnected.

Changing a single parameter

may influence several downstream operations. A slight deviation in mixing time, temperature, curing conditions, acid filling, charging parameters, or inspection methods can eventually affect product performance and reliability.

The consequences may include:

- ▼ Increased rejection rates
- ▼ Higher warranty claims
- ▼ Reduced product life
- ▼ Inconsistent product quality
- ▼ Increased manufacturing costs
- ▼ Safety hazards
- ▼ Loss of customer confidence

Ironically, the person making the change often never realizes that the root cause of these problems was the seemingly insignificant shortcut taken weeks or months earlier.

Why Do SOP Deviations Occur?

Several factors contribute to poor SOP compliance:

- ▼ Overconfidence arising from years of experience
- ▼ Pressure to increase production
- ▼ Attempts to save time or effort
- ▼ Inadequate supervision
- ▼ Lack of refresher training
- ▼ Failure to understand the purpose behind each process step

When employees know “what” to do but not “why” they are doing it, compliance gradually weakens.

Building a Culture of SOP Compliance

Issuing SOPs alone does not

Inspirational Thoughts

- ★ Most great people have attained their greatest success just one step beyond their greatest failure.
- ★ Goodness and badness lie in a person's actions. Some craft an arrow from bamboo to wound someone... while others fashion a flute from it and fill it with melody.
- ★ Criticism is the rule of this world—something you will receive in abundance.
- ★ Everyone May Not Be Nice, But There is Something Nice in Everyone. Never Keep a Fixed Image for anyone, Because People Act Differently With Different people at Different times.
- ★ To be Born with a personality is an accidental gift from ur parents, but 2 Die as a personality is an achievement of ur own & return gift to ur parents.

– Ajay Gupta,

AK Auto Agency, Mumbai

Forwarded by the President,

Indian Battery and Accessories

Industries Welfare Association, Mumbai



ensure compliance. Organizations must build a culture where following procedures becomes second nature.

Some effective practices include:

1. Explain the “Why”

Training should not merely involve reading out the SOP. Employees should understand the scientific or technical reason behind every important step.

People follow procedures more willingly when they understand their purpose.

2. Regular Refresher Training

Even experienced employees require periodic training. Refresher sessions reinforce good habits and eliminate incorrect practices that may have crept in over time.

3. Supervisory Vigilance

Supervisors should routinely observe actual practices on the shop floor rather than assuming that SOPs are being followed.

What is written and what actually happens are sometimes very different.

4. Encourage Questions

Employees should feel comfortable asking why a particular procedure exists. Healthy discussions often improve understanding and even help identify opportunities for legitimate process improvements.

5. Review SOPs Periodically

Processes evolve. Raw materials change. Equipment is upgraded. Customer expectations increase.

SOPs should therefore be reviewed regularly to ensure they continue to reflect best practices.

6. Discipline Drives Excellence

The objective of an SOP is not to restrict employees but to ensure that every product leaving the factory meets the same quality standards irrespective of who performs the operation.

Discipline in following standardized procedures produces consistency.

Consistency produces quality.

Quality builds customer confidence.

And customer confidence ultimately determines the long-term success of every manufacturing organization.

As I often say:

The best operator is not the one who knows the most shortcuts, but the one who consistently follows the right procedure.

Experience is invaluable. However, experience delivers its greatest value only when it is supported by discipline and respect for established processes.

SOPs are not obstacles to efficiency — they are the roadmap to sustainable excellence. 

When employees know "what" needs to be done but do not know "why" they are doing it, adherence to rules gradually weakens.

The Point





Micro, Small and Medium Enterprises Development (Amendment) Bill, 2026 passed by Parliament

Provisions for punishment have been removed from the category of offenses.

The Micro, Small and Medium Enterprises Development (Amendment) Bill, 2026, was passed by the Lok Sabha on 7th August, 2026, subsequent to its passing by the Rajya Sabha on 3rd August, 2026. The Micro, Small and Medium Enterprises Development Act (MSMED Act) was notified in 2006 and has completed 20 years of its enactment. Over the years, the MSME landscape has witnessed rapid changes due to technological advancements, emergence of IT enabled systems and changing legal landscape, which required that the MSMED Act be amended to facilitate growth of MSMEs. The number of MSMEs registered on Udyam have increased from 1.65 crore as on 01.04.2023 to 9.16 crore now. MSME sector provides employment to over 40 crore people and is considered to be the backbone of Indian economy.

The amendments in the MSMED Act have been done to strengthen the legal framework

governing the development of MSME sector, improving the ease of doing business, creating an enabling business environment through decriminalisation, providing institutional mechanisms for promotion of MSMEs and addressing delayed payment issues faced by the Micro and Small Enterprises.

Key highlights of the amendments made to the MSMED Act

The following are the salient features of the amendments done in the MSMED Act:

1. To align the Act with changing MSME landscape: MSME classification based on twin criterion of "Investment in plant/machinery" and "Turnover" has been incorporated in the Act. The Bill provides permanence to the Udyam Registration Portal as a Digital, free, and voluntary registration platform for MSMEs. The registration for

MSMEs is voluntary.

2. To strengthen the mechanism for addressing Delayed Payments and provide for enforcement of arbitral awards for the MSEs:

The amendment provides for Online Dispute Resolution to ensure that MSEs are able to resolve their disputes in a timely and cost-effective manner. It mandates the courts to order for payment at least fifty per cent. of the awarded amount to the micro and small enterprises suppliers, if the application to set aside decree, award or order is pending for more than six months.

3. To ensure faster adjudication of delayed payments disputes:

The amendment introduces timelines to ensure faster adjudication of delayed payment disputes. Under the amended provisions, the MSEFCs or mediation service provider, as the case may be, is required to complete the mediation within a period of ninety days from the date fixed for first appearance. Thereafter, the MSEFCs are required to refer the matter for arbitration within a period of thirty days from the date of termination of mediation. Subsequently, the MSEFCs or any institution or centre providing alternative dispute resolution

services, as the case may be, is required to make the award within a period of ninety days from the date of completion of pleadings.

4. To strengthen recoveries of dues:

Under the amended Act, any mediated settlement agreement or arbitral award made by the Facilitation Council, or through a mediation service provider or any alternative dispute resolution institution under Section 18, can be recovered as an 'arrear of land revenue' through the District Collector, Deputy Commissioner, or any notified authority in the jurisdiction where the buyer's assets are located.

5. To facilitate faster payments to MSMEs:

All Central Public Sector Enterprises (CPSEs) to route the settlement of invoices through a Trade Receivables Discounting System Platform (TReDS) for procurement of goods and services from MSMEs. The amendment also provides an enabling mechanism for States to nudge their PSEs to avail invoice settlement through TReDS. It is pertinent to note that TReDS has emerged as an institutional platform to provide additional liquidity and ensuring timely payments to the

The Act incorporates the classification of MSMEs based on the dual criteria of "investment in plant/machinery" and "turnover." This bill establishes the 'Udyam Registration Portal' as a permanent digital, free, and voluntary registration platform for MSMEs. Registration for MSMEs is voluntary.

The Point



MSMEs. The volume of invoice discounting on TReDS has increased from Rs. 40,000 crore in 2022-23 to Rs. 3.47 lakh crore in 2025-26. The compulsory routing of invoice settlements by CPSEs will further mitigate the payment issues of MSMEs.

6. To introduce flexibility and create enabling provisions for States to decide composition of Micro and Small Enterprises Facilitation Council (MSEFC) thereby forming more MSEFCs:

The composition of MSEFCs has been rationalized to enable State governments to establish multiple MSEFCs for faster disposal of disputes regarding payments due to MSEs. The amendment also empowers the State Governments to make rules for MSEFCs.

7. To enhance the Ease of Doing Business and bring trust-based regulations in the MSME ecosystem:

The amendment provides for decriminalisation and replaces conviction-based fines with graded civil penalties. Earlier, under the MSMED Act, non-filing of registration or non-supply of information was penalised with

conviction and a fine. Now, under the amended provisions of the Act, the penal provisions have been decriminalised. In the instances of furnishing wrong information, a warning will be issued in the first instance, and a penalty will be levied in case of second and subsequent instances. The conviction and fine for non-disclosure of unpaid amounts with interest in annual accounts by buyers has been replaced with a warning on the first instance, a penalty for the second instance, and a fine for the third and subsequent instances. It promotes Ease of Doing Business and fosters a trust-based regulatory environment.

These amendments are in line with the Government's commitment to the vision of Viksit Bharat @2047. A vibrant MSME sector is the key for achieving inclusive, sustainable and employment-intensive economic growth. The amendment of MSMED Act will boost formalisation of enterprises, provide pathway for scaling-up of MSMEs, enabling them to become Champions of growth. This will also augment Ease of Doing Business and promote compliance. 

To The Point



The Micro and Small Enterprises Facilitation Council (MSEFC) is a statutory body established by state governments. It acts as an arbitrator in disputes related to delayed payments to micro and small businesses.

MICROTEX[®]

Which one is Better

Lithium Ion Battery or Lead Acid Battery?

To help and develop the lead battery entrepreneurs of the country, Microtex Energy Pvt. Ltd., Bangalore has posted many blogs on batteries and battery-related topics on its website microtexindia.com. We are publishing one of these blogs 'Lithium Ion Battery or Lead Acid Battery' here.

There is a common misconception that lead acid batteries are old technology. The perception about lithium ion batteries is different, it is modern, clean, has 3 or 4 times higher energy density and a longer life cycle. With all this, what potential benefits can 150 year old lead acid technology offer?

In fact, not everything is as it seems, look at the figures used in the marketing claims behind the headlines, then use a little common sense, basic research and some basic science. You will find that the real story is quite different.

The first misconception relates to volume and specific energy density. The values of 4 to 5 times only relate

to specific energy density and a limited number of lithium ion battery chemicals, some of which are not yet in commercial use. Figure 1 compares several cathodes for lithium ion battery cells. These cathodes range from about 100Wh/kg for the safest Li-FePO₄ chemistry to over 200Wh/kg for nickel-cobalt-aluminum oxide types. A diagram of a lead acid battery is given below. These values apply only at the single-cell level, not the pack or in-service state. Figure 2 shows the energy densities of different battery chemistries at the cell and system level. The energy density of lithium ion battery cells is practically halved when fully installed with all connections, cooling, protection and battery management devices.

When fully set up with all connections, cooling, protection and battery management devices, the energy density of lithium ion battery cells is practically halved.

Lithium Ion Battery or Lead Acid Battery?

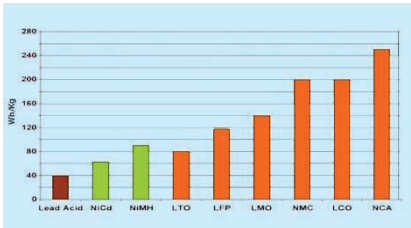


Figure-1

The cell level advantage of 3 to 5 times the typical energy density is reduced to 2 to 3 times. Depending on the lithium cathode chemistry, we can see near parity between the energy densities of lithium ion batteries and lead acid batteries for a fully installed battery system in some applications.

The second factor, cycle life, is also a source of confusion. How many cycles can a lithium-ion battery complete before its capacity drops below 80% of its nameplate rating? Two, three thousand? Table 1 summarizes various lithium-ion cathode materials for performance and life cycle.

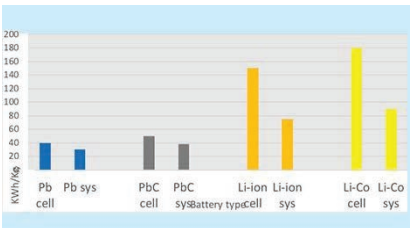


Figure-2

Advantages of Lead Acid Battery Chemistry

Everybody needs batteries. They are purchased only when needed. How many people plan to go to the local mall to buy batteries? They are an unwise purchase and are only purchased when absolutely necessary. A good salesman can sell you two pairs of shoes, two cars and maybe two houses if you have the money, but he cannot sell you two SLI automobile batteries.

Lead acid batteries can be expensive for commercial or domestic use. What is the payback, life and replacement cost of a lead acid

Cathode material	Short name	Nominal voltage	Specific energy Wh/kg (cell)	Cycle life	Comments
Lithium Cobalt Oxide (LiCoO2)	LCO	3.6	150-200	500-1000	Portable devices - thermal runaway on overcharge
Lithium Manganese Oxide (LiMn2O4)	LMO	3.7	100-150	300-700	Power tools, medical devices - safer than LCO
Lithium Nickel Manganese Cobalt Oxide (LiNiMnCO2)	NMC	3.6/3.7	150-220	1000-2000	E-bikes, EV, industrial - high cycle life
Lithium Iron Phosphate (LiFePO4)	LFP	3.2	90-120	1000-2000	EV, SLI, Leisure - safest of all lithium ion battery chemistries
Lithium Nickel Cobalt Aluminum Oxide (LiNiCoAlO2)	NCA	3.6	200-260	500	Industrial, EV powertrain (Tesla) TR at 150C, CL 500
Lithium Titanate (Li4Ti5O12)	LTO	2.4	50-80		UPS, Solar, EV powertrain (Honda, Mitsubishi). CL 3000-7000 - very safe

Table-1
Battery Directory & Year Book (Vol.41 No.16)
16-31 August 2026 (Published on 14.08.2026)

battery? What is the size you need, how much space is available, what is the energy efficiency and recharge time of a lead acid battery? And then, there are the hidden costs of safety, disposal and carbon footprint. This article compares lead acid batteries to lithium ion batteries and addresses many misconceptions about both chemicals.

Which Lithium Ion Battery is Best

As can be seen in Table 1, all lithium batteries fall in the range of 800 to 2000 cycles. In comparison, a well-designed lead acid battery can easily achieve efficiencies of 80% DOD from 1600+ cycles.

How much do lithium-ion batteries cost compared to lead-acid batteries? What is the cost of a lithium-ion battery manufacturing plant? Naturally, lithium-ion batteries are more expensive, but by how much? Again, it depends on the scale in question. Press releases will tell us that lithium-ion prices are falling and are now in the 2-3 times range of lead-acid. But let's see how true this is. A 12V and 100Ah lithium-ion battery costs \$960 or \$800/kWh and a lead-acid battery costs \$215 or \$180/kWh. Obviously, to achieve the same price the lithium-ion battery should have a lifetime 4 times that of the equivalent lead-acid battery but this is not the case.

In all cases, lead-acid battery

construction was the most cost effective, even if a larger lead-acid battery was installed to provide better charge receptivity and longer life. The same principle applies in most applications and geographies, especially in cold climates.

The second misconception is that lithium-ion is a cleaner technology and less polluting than lead-acid. Cradle-to-gate emissions for different battery chemicals are given in Figures 5 and 6.

This figure shows the range of operations for battery manufacturing. From the extraction and transportation of raw materials through all processing steps to the point where the batteries are ready for shipping.

Table 2 is a real-life scenario that compares the economics of using lithium-ion batteries and lead-acid batteries.

Data from Argonne National Laboratories show that the total manufacturing process, including the extraction and transportation of raw materials, for lithium-ion batteries is 4 times the lead-acid value. Regarding the extraction of materials, the supply of basic cathode materials such as cobalt, manganese and lithium is not completely certain. Extraction and recycling processes exist, but if demand increases significantly, the number of mines and manufacturing sites may limit supply. The geopolitical map also predicts uncertainty for some of the

All lithium batteries fall in the range of 800 to 2000 cycles. In comparison, a well-designed lead acid battery can easily achieve over 1600 cycles at up to 80% DOD.

Lithium Ion Battery or Lead Acid Battery?

Cost item	Daily running costs USD	Daily running costs USD
3 Years	Lead Acid Battery	Lithium ion battery
Amortisation	8.30	16.90
Diesel (delivered)	15.50	15.50
Maintenance	2.46	2.46
Electricity	1.47	1.47
Battery Charging	0.65	0.50
Total day/month	28.38/851	36.83/1105
6 Year		
Amortisation	5.86	8.46
Diesel	15.50	15.50
Maintenance	2.46	2.46
Electricity	1.47	1.47
Battery Charging	0.54	0.50
Total day/month	25.83/775	28.39/852

Table-2

sources of these substances.

Are Lithium Ion Batteries Recyclable?

The recyclability and safety of these chemicals are important factors. It is known that almost all components of lead acid batteries are 100% recycled, whereas there are no commercial processes for recycling lithium ion batteries. This situation is understandable when you consider that the more expensive components such

as Li, Co, Mn, etc. make up only a small fraction of the total lithium ion battery. For example, lithium accounts for about 4% of the total cell weight. In addition, there is the obvious fact that lithium is highly reactive (the basis for its high energy density), making it inherently expensive to extract from scrap.

The complexity of the many different materials used in its manufacture makes recycling both technically and economically difficult. As a result, there is no commercial incentive

to recycle these batteries. For this reason, recycling facilities are still in the experimental stage and are mostly government funded.

Currently, most discarded lithium-ion batteries are sitting in storage awaiting either a technological breakthrough or legislation requiring their recycling. If that happens, consumers will ultimately pay the price. This will further increase the cost of lithium-ion cells compared to lead-acid batteries.

Can lithium-ion batteries explode?

Finally, we have safety. To our knowledge, there has never been a safety recall for any lead-acid battery used, as we know of for lithium-ion batteries in portable electronic devices and even electric vehicles.

Lithium-ion battery fires

Lithium-ion batteries have also been the cause of seriously dangerous fires during storage or transportation. Although these incidents are rare, they must be acknowledged and appropriate safety equipment and battery management software should be installed. For example, the New York Fire Department is still in the process of determining how to handle lithium-ion battery fires. This makes it clear that existing safety measures for lithium-ion batteries worldwide need to be reviewed.

Lithium Ion Better or Lead Acid Batteries?

Lithium-ion batteries certainly have better performance characteristics than lead acid. However, these advantages are severely reduced due to the

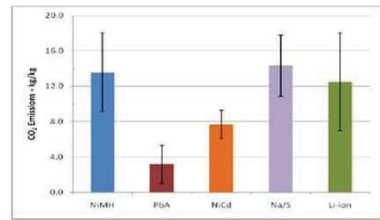


Figure-6

additional hardware associated with safety and management requirements. Overall, lead acid batteries have distinct advantages, especially when considering applications that are not restricted by load or charge acceptance. The low initial cost of lead acid battery manufacturing plant; the low purchase price and low amortization cost of lead acid, combined with its low environmental impact and inherent safety, provide the following advantages:-

1. Low purchase price - The price is approximately one-fourth of the lithium-ion equivalent. Low operating costs reduce the total cost of ownership in most applications.

2. Recyclability - Nearly 100% of lead acid battery material is recycled. The scrap value can provide additional revenue of up to 20% of the battery material cost. Lithium batteries have no infrastructure or commercial process for recycling.

3. Safety- Lead acid chemistry is inherently safer than lithium ion batteries.

4. Sustainability- There are many well-established sources of supply of lead acid, particularly from recycling facilities. Lithium and other cathode materials can be supplied from politically sensitive areas. Both current global material extraction and manufacturing capacity will not support rapid growth in

lithium ion battery production.

5. Carbon footprint- The cradle-to-gate carbon footprint of lead acid battery manufacturing is one-third of that of lithium ion batteries.

A different picture than that presented by lithium battery companies

While it cannot be argued that lead acid lacks energy density, the truth is that lead-acid batteries are still highly safe, competitive and the best choice of battery technology in many applications.

What is a Lithium Ion Battery?

Cathode and Anode Materials: Although nickel-metal hydride (Ni-MH) cells were preferred in the early 1990s, the world's first commercial lithium ion rechargeable battery product was released by Sony Corporation in 1991. It quickly captured the market and became

an indispensable source of power for audio and video equipment, personal computers, portable telephones, and other portable devices.

Today's advanced battery technology began with the discovery of the high ionic conductivity of sodium β -alumina NaAl₁₁O₁₇ by Kummer and his coworkers at the Ford Motor Company laboratory.

As expected, the possibility of homogeneous lithium systems was soon considered, since it was believed that an equivalent lithium cell would produce a higher voltage than a sodium cell. In addition, lithium weighs less than sodium, another advantage.

Due to its low melting point, the original lithium could not be used. Instead, solid lithium alloys, primarily Li/Si and Li/Al systems, were tested. □

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Clusters Offer Many Benefits

Strong clusters, better access to finance, and robust university-industry linkages can help MSMEs become engines of employment, productivity, and exports.

Given the threat AI poses to existing jobs, India needs sectors that drive robust job creation, and the MSME sector is one of the best options for this.

The US and China did not achieve industrial might by simply supporting individual companies; instead, they created 'clusters.' A cluster refers to an ecosystem where suppliers, product manufacturers, parts makers, the workforce, and

research institutions are located in close proximity and reinforce one another.

China's Guangdong region—particularly Shenzhen—demonstrates how industrial zones offering land, tax incentives, and infrastructure can foster robust supplier networks, enabling companies to rapidly design, manufacture, and prototype

Clusters are reducing their fixed costs by sharing various infrastructure facilities such as testing labs, effluent treatment plants, cold storage, design centers, and logistics hubs.

The Point



products. Additionally, China's "Little Giant" program provides financing, tax relief, and R&D support to small companies operating in specialized sectors.

Cost Reduction through Shared Infrastructure

Clusters both attract and retain talent. While it is difficult for a single MSME to hire workers with specialized skills, a cluster of companies creates a genuine labor market, making the location more appealing to skilled professionals. Clusters reduce fixed costs by sharing various infrastructure facilities—such as testing labs, effluent treatment plants, cold storage units, design centers, and logistics hubs. These facilities are often prohibitively expensive for a small company on its own but become cost-effective when shared among multiple enterprises.

Cluster-based programs, such as the MSME Cluster Development Program and PM MITRA Textile Parks, already exist in India. However, many of these still function primarily as providers of infrastructure grants rather than fostering a genuine ecosystem.

Key Points

The following points may prove useful.

First, India should move beyond generic industrial estates and focus on creating specialized clusters. Instead of mixing diverse businesses within a single park, resources should be concentrated in sector-specific hubs—such

as auto components in Pune, pharmaceuticals in Hyderabad, and electronics in Sriperumbudur.

Second, India should develop its own version of the 'Little Giants' program. Rather than treating all MSMEs alike, policy should identify "hidden champions" that are already excelling in niche areas like precision casting, specialty chemicals, or defense components. These companies could be provided with dedicated credit lines, expedited patent processing, R&D support, and preferential procurement facilities.

Third, the issue of financing needs to be addressed at the cluster level. While the credit gap for MSMEs is substantial, banks still evaluate companies individually. Cluster-based lending—which assesses shared collateral, buyer-supplier relationships, and collective performance—can mitigate information asymmetry and reduce risk. The Tiruppur textile cluster offers a valuable model that could be scaled up through SIDBI and cluster-focused NBFCs.

Fourth, Universities must be placed at the heart of the MSME ecosystem. In India, top universities often remain disconnected from nearby industries. In contrast, cluster models in China and the US rely on universities for talent, applied research, laboratory infrastructure, and innovation.

Robust clusters, improved financing, and strong university-industry linkages can help MSMEs become engines of employment, productivity, and exports. 

Nano-Sized Lead Oxide [PbO] for Superior Performance of Lead-Acid Battery

– C.S. Ramanathan –

Battery Consultant, ramanathancs58@gmail.com; 9845049975



C.S. Ramanathan

In the last two ILZDA international conferences and Power-On seminars. I have been discussing the possibility of producing Nano-sized PbO for paste-making. All along, it has been considered that the nano-PbO manufacturing process is not suitable for scaling up, although many laboratories have successfully produced and tested it in laboratory-scale batteries. Now I wish to bring to your notice a process which shows promise of scaling up

The main reason for the failure of scaling up is the mismatch between the rate of lead acetate solution (nebulisation) and the drying rate, which drives out water and causes the lead salt to decompose into Lead Oxide. This is essentially an engineering problem.

A potentially successful procedure uses insoluble lead Carbonate [ref: Materials Research Bulletin, 43 (2008) 3054, by Hasan Karami et al.]. In this process, there is no water to be

evaporated, and hence the drying load is less, helping in scaling up the making of nano PbO

The Lead carbonate precipitated from Lead Nitrate and Sodium Carbonate is already nanosized. The authors provide a detailed procedure for obtaining nanosized PbO. Agglomeration is controlled by using Polyvinyl Pyrrolidone (PVP- Povidone-) during precipitation

Procedure

The Lead is first converted into a soluble salt of lead- lead acetate, lead nitrate, or Lead Citrate. In the suggested procedure, it is converted into lead carbonate. The authors have provided detailed procedures for precipitating lead carbonate at the nanoscale. It is prevented from agglomerating. In the final stage, the lead carbonate is calcined to give Lead oxide PbO. In this process, there is no need to drive out large volumes of water. Therefore, this becomes suitable for scaling up production. REF:1) private communication: Ramachandran Kumar, Professor at Cambridge University and Dr Athan Fox in Cambridge. 2) Materials Research Bulletin: 43 (2008) 3054 by Hasan Karami et al.

Why choose precipitated Lead Carbonate?

i) Lead carbonate is insoluble in water and can be precipitated from a soluble solution of lead, such as lead

acetate, Lead nitrate, Lead Citrate. At this stage, the processing conditions result in the formation of NANO-SIZED particles. Agglomeration is prevented with PVP in solution. The authors have given details of all other parameters which should be maintained during precipitation: ii) Any moisture in the precipitated Lead Carbonate can be driven off by drying at 120°C iii) Calcination can be done at 300°C to decompose the carbonate. Carbon dioxide is driven off, leaving nano-PbO in powder form.

ii) If we choose ultrasonic nebulisation of Lead acetate solution, there is excess water, which requires a large surface area to dry out the water and decompose the acetate to PbO. This is the reason for not choosing the soluble salts

iii) There is no need to use very high temperature for calcination. The process is scalable, whereas it is not with soluble salts.

iv) Processing soluble salt solutions needs ultrasonic Nebulisation; whereas the precipitation of nano-sized Lead carbonate is only by sonification at a 20- 40 kHz frequency without nebulisation.

All of us are aware that lead-acid batteries face an existential threat in certain applications. This situation will change drastically when we can make nano PbO on a large scale or pilot scale

Research effort of lead-acid Battery stakeholders

Many lead battery stakeholders are conducting targeted research, coordinated by the Consortium of Battery Innovation (CBI), ILZRO, and ILZDA in our country. While these efforts are commendable, they fail to address

the core issues that could restore the lead-acid battery to its former dominant position. Many new technologies, such as EFB starter batteries as an alternative to the more expensive VRLA, are praiseworthy; however, they are not sufficient to achieve our goal. We need to look for a solution elsewhere

Using Nano Lead Oxide

We need a boost —a QUANTUM LEAP in technology. At this point, the development and use of nano-lead oxide for paste-making represents a significant technological leap. Numerous papers have been published in the scientific literature on the use of nano-PbO. I have highlighted these activities at the last two ILZDA and Power-on conferences. They are still only Laboratory efforts.

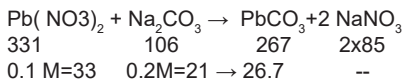
Scaling up Nano PbO manufacturing

Scaling up to produce large quantities of nano PbO is challenging. However, we can achieve kilo-level production of nano-lead oxide via sonification during the precipitation of Lead Carbonate. Western countries will only accept production rates of tonnes per day. However, in our country, many SMEs produce fewer than 50 batteries a day. Production in kilograms is acceptable to them.

As you are aware, the Nano size is 1000 times smaller than the conventional ball mill oxide, which has an average size of a few microns (micrometres). With nano PbO in Paste, the surface area increases manifold, and so does the number of reaction sites. This results in higher electrical performance and higher material utilisation; higher Ah capacity even

at a 2C rate of discharge and charge acceptance at high currents of 2C.

Method of making nano Lead Oxide -PbO-scaled up-dry method -recommended



In a 5000 L reactor vessel, Lead nitrate 99 kg, 0.1 M) is dissolved in 1000 L of water. Sodium carbonate (0.2 M): 63 kg is dissolved in 500 L of water in a separate vessel and added slowly. A temperature of 40 °C is maintained. PVP is dissolved in the Lead nitrate solution before precipitation. A submerged Sonicator generates cavitation, reducing the particles to nanosize. It runs at 20-40 kHz to precipitate lead carbonate (62 kg) in nano size with high porosity. The contents are filtered in a plate-and-frame press. All the conditions used by the authors should be followed.

Properties of Nano PbO

The nano battery's superior performance, including 1C and 2C cyclability, yields a significantly better battery. Alternatively, if you prefer, the amount of paste can be reduced by 27 %, resulting in significant cost savings.

The difference in performance

is due to the larger surface area and the inherent characteristics of nanomaterials. Conventional PbO produced in ball mills yields micron-sized particles. Nano PbO is 100-1000 times smaller, and its surface area increases proportionately. This means many multifold reaction sites are available, which can sustain higher currents or lower currents for longer discharge durations. The material utilisation is higher.

The use of nanoparticles in many other applications is well-known. For example, the pharmaceutical industry makes nanoparticles to improve the effectiveness of medicines. Similarly, Nano PbO exhibits markedly different characteristics from the conventional grey oxide produced by the ball mill. The higher cost of nano PbO is justifiable because we get a superior battery.

How to make nano PbO?

Two methods: Dry and wet methods. In the dry process, the ball mill oxide is ground further to a smaller size. Sovema ball mills are now capable of reducing the average particle size to one micron. We cannot achieve further size reduction beyond this by grinding. A German company grinds it further to a nanoscale size, but the yield is only 10-15 g over 3-4 hours on

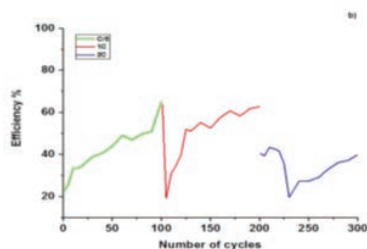
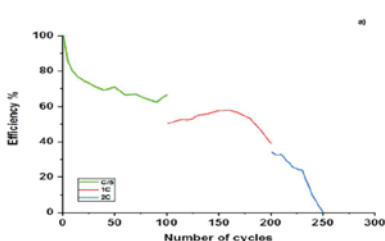


Fig. 1) Comparison of Commercial Auto Batteries and Nano Batteries.
IEEE Conference Paper · November 2021. R.L. Oliveri et al.

	Soluble lead salt -Lead Acetate	Insoluble Lead Carbonate
Precipitation	No precipitation but dissolution of Lead acetate or nitrate, citrate)	Lead carbonate is precipitated from lead nitrate and sodium Carbonate
Process	Ultrasonic nebulization of lead acetate solution	Sonification during precipitation of Lead Carbonate
Frequency	120 kHz	20-40 kHz
Product before calcination	Lead acetate solution sent through the nebulization head; High Water content	Very little water to be dried
Calcination	Calcination removes water and decomposes acetate to lead Oxide PbO	Calcination at 300 °C decomposes lead carbonate to PbO, releasing carbon dioxide and leaving behind nano-sized PbO powder.
Final PbO	Low output- not acceptable	Can be scaled up.

Table 1: Comparison of nebulization and calcination of lead acetate solution and calcination of insoluble lead carbonate to get nano PbO

a laboratory-scale machine. Therefore, the dry method does not meet our requirements.

Cost: Calculations show a 20% increase in the price of nano PbO compared to grey oxide

Recommended procedure to get nano PbO – Lead carbonate process

* Lead Nitrate in solution in a 2500-3000 L SS reactor- 99 kg in 1000 L of water

* Add PVP 1 g/L – 1.5 kg in the reactor

* Sodium Carbonate solution in a

separate 1000 L vessel – 63 kg in 500 L of water

* An immersible Sonicator working at 20-40 kHz frequency is used. This (cavitation) generates heat and should be cooled to 40°C by passing cold water through the jacket of the reactor. No Nebuliser is necessary

* Complete the addition of Sodium Carbonate in about 60 minutes

* A precipitate of Lead Carbonate 62 kg will be obtained.

* Filter through a plate and frame press; the cake is Lead Carbonate

* Wash the cake 3 times with DM water to remove sodium Nitrate

* Take out the cake of lead carbonate and dry at 120 °C in a drier

* After drying, carry out calcination by heating in a furnace to 300 °C to decompose the Lead Carbonate into PbO and carbon dioxide

* The final PbO powder will be nano-sized and porous. The porosity helps with better acid irrigation.

* The nano PbO has a much larger surface area, more reaction sites for charge and discharge. It can sustain a discharge at 2C. Yield of PbO is

about 50 kg per batch. With 3 batches a day, we can get 150 kg- pilot-scale production

* Investment is ₹ 30 Lakhs for machinery.

Paste making, Pasting, and Tubular powder filling

Flat Plates: Paste mixing will give a lower density. Pasting is similar to conventional grey oxide.

Tables for Comparison of Grey Oxide and Nano-sized PbO.

The three tables below provide quantitative figures for some parameters.

Table 1: Comparison of Grey oxide 70/30 from Ball Mill and Nano PbO

	Grey Oxide 70/30	Nano Lead Oxide -PbO
True Density	10.02 g/cm ³	9.5 g/cm ³
Apparent Density	1.3-1.5 g/cm ³	0.5 g/cm ³
Melting Point °C	888 °C / 327 °C	888 °C
Average Particle size	3-12 µm –micrometre)	30 nm -(Nanometers)
Surface Area	2.3 m ² / g	32 m ² / g

Table 2: Comparison of Electrical Parameters

	Grey Oxide (Ball Mill)	Nano PbO
Active Material: g/Ah	9 g /Ah	6.3 g /Ah
Discharge duration C20	5 hr.	6.2 hr
Discharge Duration: 1C	drooping curve	Efficiency increases over 100 cycles
Discharge duration 2C	Drooping Curve	Efficiency increases over 100 cycles

Table 3: Comparison of particle size, surface area and Sulphation

Properties	Ball Mill Oxide	Nano-sized PbO
Particle Size	1-10 µm –micrometre)	20-100nm -(Nanometre)
Surface Area	0.5-1 m ² /g	32 m ² /g
PbSO ₄ formed on Discharge.	Slow	Fast
Hard Sulphation Tendency	Yes, high, especially under PSoC conditions	Very Low
Charge Acceptance	Moderate	High
Deep Discharge Recovery	Limited	Good
Cost estimated	₹ 180 / kg	₹ 230 / kg

China to End Tax Exemptions for Lithium-Ion Batteries

China will impose a consumption tax on lithium-ion batteries starting in September 2026, ending a tax exemption that has been in place since 2015. According to China's Ministry of Finance, a 2% consumption tax will initially apply to lithium-ion batteries. This rate will rise to 4% in September 2027.

Tax Incentives Shift Toward New Battery Technologies

In addition to lithium-ion batteries, the new consumption tax will apply to lithium primary batteries, mercury-free primary batteries, nickel-metal hydride batteries, and vanadium redox flow batteries. While the tax will be phased in for these products, sodium-ion batteries and solid-state batteries will remain exempt from September 2026 through the end of 2028.

According to Chinese officials, battery products must comply with applicable national standards. Companies will also be required to submit compliance test reports when applying for the tax exemption for the first time.

Shift in Industrial Policy

China states that the aim of these policy changes is to promote industrial upgrading and environmental protection. Reuters also reported that Chinese policymakers are seeking to reduce excess production capacity in various sectors, including the battery industry. These tax adjustments follow other changes to tax incentives for alternative-energy vehicles and signal a gradual reduction in government tax support for certain segments of the battery sector. □



Tubular Plates: Due to the small particle size, there will be a loss of powder through the waves of the Oxide Holder tube during handling. With a closer weave, the electrical resistance will be higher. The remedy is to coat a barrier (resin Film), which will be removed during plate pickling. Polyvinyl Alcohol meets our requirements.

We need to take it up with the tube manufacturer

This process can be considered after a trial in tube filling of nano oxide

Different laboratory Trials

Various processes are reported in laboratory trials. But scaling up is not successful except by the LEAD CARBONATE method. The main advantage is less water to be dried in Lead carbonate. □

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Three Injured in Explosion While Charging Scooty Battery

A fire broke out in a shanty in Delhi's Ashok Vihar area on the morning of July 23 following an explosion that occurred while a scooty battery was being charged. Three brothers sustained burn injuries in the incident; the condition of two of them is reported to be critical.

According to the police, information regarding a battery explosion in a shanty was received at the Ashok Vihar police station around 7 AM. Upon arriving at the scene, the police found that the resident family had kept their scooty battery inside the shanty for charging. The battery suddenly exploded during the charging process, sparking a fire.

This incident has once again raised questions regarding the safety of electric vehicles. However, it remains a matter of investigation whether the explosion was caused by a battery defect or some other technical issue. ☐

Fire Breaks Out in House

Caused by Exploding Electric Scooter Battery

A fire broke out in a house in Shalimar Garden Extension, Sahibabad, on the night of July 10 due to the explosion of an electric scooter battery. The affected family saved their lives by cutting through the window grille to create an exit and jumping down. Hardeep Singh, a resident of Shalimar Garden Extension, stated that he lives in the house as a tenant on the first floor with his wife and two sons. Due to rain, the colony was waterlogged, so he had removed the battery from his electric scooter and kept it inside the room.

During the night, the battery suddenly exploded, causing the mattress and other belongings in the room to catch fire. Within moments, the flames spread to the front section of the house. The family realized a fire had broken out when the room filled with smoke; however, the fire blocked their exit.

He moved his wife and children to the rear of the house and raised an alarm to gather the neighbors. They cut through the window grille to create an escape route. With the help of the neighbors, he first got his wife and both children out safely and then jumped down himself. Bystanders alerted the fire department, and fire personnel arrived at the scene to bring the blaze under control. ☐

E-scooter battery explodes and catches fire outside pizza store

On the afternoon of May 29, an e-scooter used for deliveries suddenly caught fire following an explosion while parked outside a pizza outlet in Chhatarpur, Madhya Pradesh. The fire spread rapidly, engulfing other vehicles



parked nearby. Within minutes, a total of eight vehicles were reduced to ashes.

The incident occurred at the Apollo Cross complex near the city's bus stand, where delivery e-scooters and other vehicles were parked outside a Domino's outlet. According to eyewitnesses, smoke suddenly began rising from one of the scooters, followed by a loud explosion and a burst of flames. The fire spread quickly to the adjacent vehicles.

Fire and police teams arrived at the scene upon receiving the information, but by then, all the vehicles had been completely gutted. Preliminary investigations suggest that a short circuit in the battery while charging caused the fire. An electricity transformer was also located near the site of the incident. □

Supreme Court seeks details from Centre and CPCB regarding the use of the Environment Relief Fund

The Supreme Court has sought a detailed affidavit from the Government of India and the Central Pollution Control Board (CPCB) regarding the 'Environment Relief Fund' (ERF), established under the 'Public Liability Insurance Act'. It is worth noting that the ERF was created to provide financial assistance to victims of accidents involving vehicles transporting hazardous substances. □



A Divine Childhood with Swami

Selfless Love, Divine Plays, and Life Lessons

– Dr. Ameya Deshpande –

I recall another truly beautiful incident. There was simply no limit to the *Prasadam* (sanctified offering) Swami would give to His children.

We received *Prasadam* of such variety that I cannot even describe it. It ranged from whole watermelons—given to the eleven children—to tiny *ber* (jujube) fruits; we received offerings of every size and type. For the children who spent their vacations at Prasanthi Nilayam, it was truly a bonanza!

Swami would toss items—like towels—down from the balcony above, as far as the eye could see; about 10 or 12 children would catch them—towels, toothpaste, toothbrushes... basically, He would throw anything, and we just had to catch it from below!

So, one day—I believe it was March, and it was quite hot—the *Prasadam* (sanctified offering) for the day was ice cream: 'Joy Ice Cream' (vanilla flavor). Trays filled with chilled ice cream were being brought out from the Lord's interview room, and we students were the ones carrying them. That was also an opportunity to enter the interview room. There wasn't a single Thursday or Sunday when we didn't go into the interview room, because Swami Himself would call out, "Come, ten boys." But twenty boys would get up and go! Once inside, Swami would point out where the *Prasadam* was kept, and we would pick it up from there. After the distribution was over, we would go back inside and stand there. Then



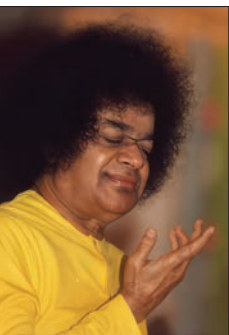
Swami would come and chat with us for a while.

That is why He is called our Chancellor—why is God, the Chancellor of this university, addressed by that title? Because He used to give so many 'chances' (opportunities)—that is precisely why He is named Chancellor! One received so many chances.

So, one day, Swami began distributing ice cream. We all brought trays and started the distribution. Swami would ask, "Will you have some more? Will you have another one?" He would affectionately call the slightly chubby children 'Pakoda'—"Pakoda, will you take another one? How about another?" The children were happily eating two or three ice creams each. Suddenly, right in the middle of the distribution, Swami asked, "Who is God?"

Everyone was eating, and the children thought, "Oh man! Where did such a question suddenly come from?"

Then Swami spoke so beautifully: "Look, God is like ice cream. How? First—just as ice cream is pure white, God is also very pure and spotless. Second—just as ice cream is sweet, God is also very sweet. And third—just as ice cream is cold, God is also very calm and cool (soothing). And that is why God's name is 'Joy'—which is also the name of your ice cream: Joy Ice Cream!"



What a beautiful thought! I do not know what better or more significant definition of God there could possibly be. Only one thing is deeply ingrained in my mind and heart—God is soothing, God is pure, and God is sweet; that is why His name is 'Joy'. Thus, Swami's profound messages were conveyed through such simple, little anecdotes.

To us, Swami was not merely God; He was our parent and our friend. I still remember—there was never a student who felt unable to speak to Swami or hand Him a letter. No matter the problem—ranging from a common cold...

Speaking of the common cold reminds me that when so many children live together, illnesses like that spread easily. Once, an outbreak of conjunctivitis—an eye condition causing watering and redness—swept through. It was highly contagious; if one touched their eye and then touched someone

else, that person would catch it too. I still remember...

There were about 700 children in our hostel. Within a week, the infection had spread throughout the entire hostel. The situation was such that during the scheduled *darshan* that Thursday, only about 50 or 55 of us from the whole hostel went to attend it.

Swami came out and asked, "Oh! What has happened?" He was told that the children had contracted an eye infection (conjunctivitis). Swami said, "Alright, I am coming." After *Darshan*, we returned to the hostel, and shortly after, Swami arrived as well. At that moment, everyone was worried and urged Swami not to go inside. All the sick children had been placed in a large hall—what we might call a 'quarantine' area today. Swami said, "I will go up." Munni Madam and the Warden Auntie pleaded, "Swami, please don't go! What if something happens to You?" Swami looked at them and smiled, saying, "Let's go upstairs; where are the children? Show them to Me." Swami went inside; the entire hall was filled with children. We (the healthy ones) stood outside. Swami waved His hand in the air and materialized such a large amount of *Vibhuti* (sacred ash) that it looked like a small mound of it! Swami said, "Mix this in water and give it to everyone; they will all recover."

This happened on a Thursday, and by Sunday, almost the entire hostel had recovered! The illness was gone. To us, this was all quite natural; it didn't seem like a huge deal—we simply felt, "If Swami has given it, everyone is bound to get well." That is the kind of atmosphere we grew up in.

Continued in next English Issue



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