

Taking the brakes off lead's journey to transition

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Pb 2023 | Athens | June 2023



Pb
2023 JUNE
21-23

Lead battery recycling - an established market still offering growth opportunities

Large and increasing lead battery market

USD 65 bn

Lead battery market size

Growing end-markets demand



Telecom towers



Uninterruptible Power Supply (UPS)

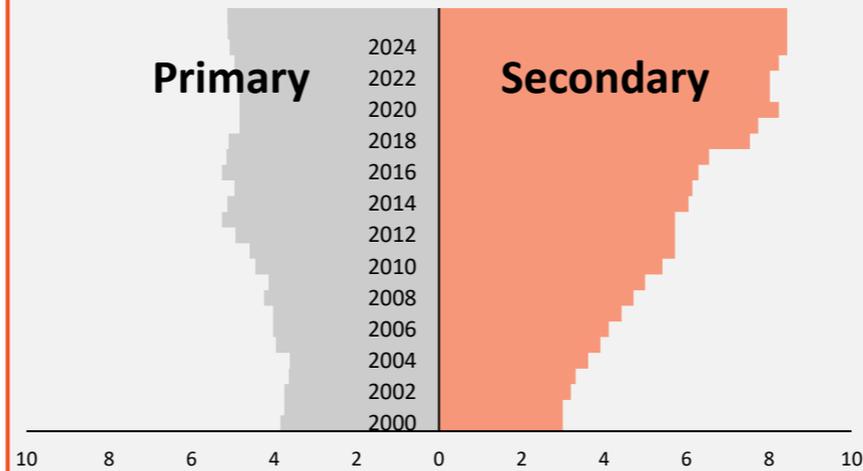


Transport & automotive

Recycling supplies 65% of the global refined lead

- ☑ Established collection infrastructures and supply chain
- ☑ Negligible growth in primary mine output

Global lead production (million tonnes)



Traditional smelters may not be sustainable in the long term



Emissions to air



Pollutants to water



Solid waste



Higher energy demands



Less safe working environment

GreenLead™ technology is revitalising the lead recycling industry

ACE Green's technology is efficient, safer and greener versus traditional methods – and has superior cost economics

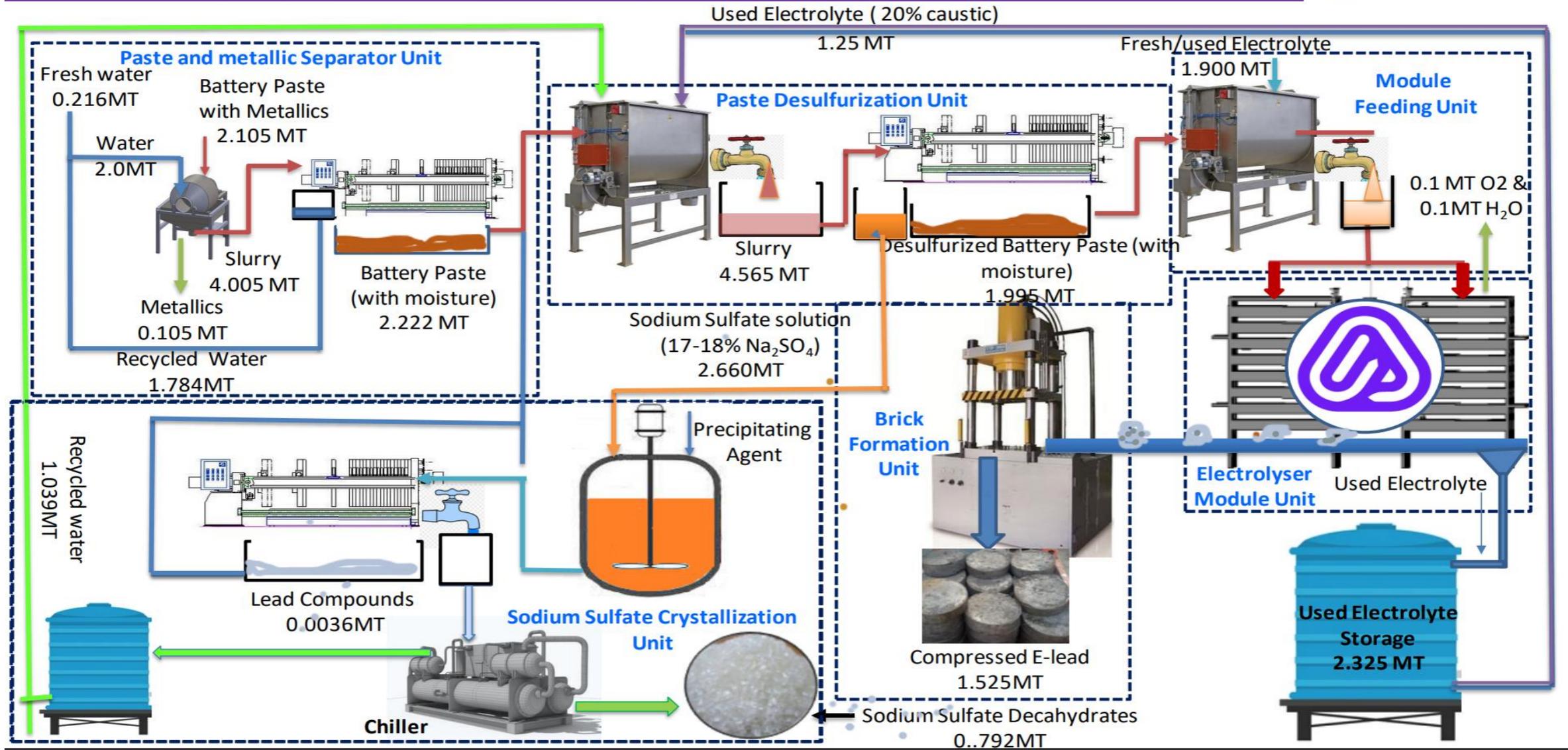
 GreenLead™ Pb recycling technology

 Traditional smelting

		 ACE Green Recycling	
Energy source	 Energy requirement	Low	High
	 Renewable power	Yes	No
Operation	 Operating environment	Room temperature	> 1000 °C
	 Modular	Yes	No
	 Human health & safety risks	Close to nil	Elevated
Environmental impact	 GHG Emission	Zero	0.5-1 kg per kg batteries
	 Oxygen release	45 kg/1000 kg batteries	None
	 Toxic waste creation	Very low volume	Higher volume
%	 Lead metal recovery %	> 99%	95-98%

ACE has successfully commercialised its sustainable Pb recycling technology

Lead-Acid Battery Recycling – Flow Diagram (Battery Paste Treatment; Part 1)



ACE is transforming how lead is recycled



ACE electrolyser modules



ACE electrolyser modules

ACE is transforming how lead is recycled



Lead extracted automatically and safely from modules with minimal operator involvement



Operators compacting 'e-lead' bricks for further refinement

Challenges in Pb production significantly inhibit the energy transition

Taking the US as an example...

Challenge 1: Overreliance on foreign lead production

- US imports about 500 kt/a of refined lead¹ – almost 1/3 of total consumption
- Domestic supply pressure increases strategic resource scarcity for energy transition
- Also increases pressure on Li-ion availability

Challenge 2: Widening gap between supply & demand

- Since 1990, US smelter closures have totalled 690 kt/a, including 235 kt/a of secondary capacity
- Pb supply-demand deficit for 2024-2040 expected to average 525 kt/a²
- Deficit expected to average 1.2%/year growth during this period

Challenge 3: Tougher regulations restrict organic growth

- Tightening regulations – especially around air emissions and blood lead – hinder potential development of domestic supply
- There are currently no scheduled increases in secondary lead smelter capacity

POCL installation status update

Total planned capacity

- Approx. 40 kt/a of scrap lead battery input
 - Special interest in smelter baghouse dust; capacity decision after Phase 1
-

Phase 1: Production stabilisation

- Paste: 2400 t/a battery input
 - Metallics: 7200 t/a battery input
 - Phase 1: small deployment at POCL Chittor facility
 - Phase 2 and beyond: expansion planned at Chennai
-

Current status

- Electrolyser modules output 'e-lead' purity:
 - 99.986% from paste
 - 99.987% from baghouse dust
 - Cost performance as per expected parameters
 - Handover to POCL team in June for paste, dust and metallics processing
 - Teething issues:
 - Minor pipework & third-party equipment (motors, valves, filter press, etc) issues resolved for local conditions
 - Manpower & feedstock availability and processing in collaboration with POCL team
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ACME status update

Total planned capacity

- Approx. 40 kt/a of scrap lead battery input
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Phase 1

- Paste: 2400 t/a battery input
 - Phase 1: separate facility allocated
 - Phase 2 and beyond: expansion planned in larger new facility
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Current status

- Detailed Engineering complete
 - Equipment under shipment from India
 - Commercial production start expected in August 2023
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Enhanced options for ACE technology deployment



- Strategic cooperation agreement between ACE and STC opens more possibilities for deployment
- ACE offers its zero Scope 1 emissions technology, with STC acting as main contractor and system integrator
- STC provides design and manufacturing of its proprietary equipment plus engineering and project management, integrating with ACE's technologies for Pb and for Li-ion batteries
- STC will be also be manufacturer of the ACE modules for EU, North America and other countries





STC battery breaking unit



ACE Green Recycling



ACE Green Recycling electrolysis modules

Seasoned management and business development teams



Nishchay Chadha



CEO

- 17 years in **recycling, global trading, mining, supply chain**
- Asia Pacific & Middle East **head for Lead/zinc & India/MENA for scrap metals at Trafigura**
- **Senior global positions in Vedanta & 2 startups**
- B. Tech. in Mining Engineering from **IIT (ISM) Dhanbad** and MBA in Finance and Strategy from **ISB, Hyderabad**



Teodoro Alban



CFO

- 25 years professional experience in **finance & treasury** with broad experience in M&A and business development
- **Held CFO position** at RDT Inc (Subsidiary of Tubos Reunidos) and Quantum Offshore Energy Services
- B.Sc in Mechanical Engineering from Brown University and Master of Finance from London Business School



Vipin Tyagi



CTO

- 11 years in **Battery materials cleantech recycling**
- **PhD in Mechanical Engineering** from **Texas A&M University** and B. Tech. in Mechanical Engineering from **IIT Bombay**
- Co-authored several peer reviewed journal and conference publications
- Ex **Merrill Lynch** Trader, USA



Sumit Sachdeva



Director – India

- 17 years in experience in **Corporate and Investment Banking** handling fund raising- both debt and equity
- Last worked as Executive Vice President and **Coverage Head** for Indian Conglomerates for Kotak Mahindra Bank, India
- MBA in Finance and Strategy from **ISB, Hyderabad**, graduated with Dean's list. Executive Program in Finance from **IIM, Calcutta**



Siddharth Roy



Business Director

- 14 years in **Base & Precious Metals, Recycling, International Trading, Logistics**
- Hindustan Zinc manager APAC
- Startups – global head of Lead & zinc



Farid Ahmed



VP Global Strategy & Business Development

- 30+ years in the **metals sector** with deep ties to industry players across the globe
- Recognized as a global thought Leader in commercial intelligence for **battery materials, energy, metals, and mining**



Aaron Wee



VP Strategy & Investments

- 10+ years in **investments, M&A, and consulting**
- Extensive VC experience in digital technology, web infrastructure, and blockchain



Meredith Matthews



VP Global Communications

- 20+ years experience in **corporate, crisis, non-profit, community and employee communications**
- Worked as PR Lead, U.S. Gulf Coast, Communications Advisor at LyondellBasell
- Former journalist and award-winning communications professional with senior-level experience in communications

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Q&A



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