Indian lead battery industry—recycling challenges

Led by economics, lead recyclers in India currently process about 0.8 million tonnes of scrap lead-acid batteries per annum. Here L Pugazhenthy, from India Lead Zinc Development Association (ILZDA), explains how regulation and monitoring is clamping down on the country's informal recycling industry.

Over the years, lead batteries have become an integral part of our lives in India such that the numbers today are just mind-boggling. As a result, used lead battery recycling has become so huge, which is good considering the need for sustainable development. At the same time recycling of used lead battery also faces numerous challenges.

Evolution

In the 1960's and 70's lead batteries were used in the forklifts on shop floors and warehouses as well as in miner's cap lamps. During the above period, a very small number of cars, two wheelers, trucks and buses were also manufactured in India. The eighties saw the entry of Suzuki of Japan joining hands with an Indian outfit, Maruti, to roll out a very small compact car. A large number of Indians showed keen interest in these cars, with the result there was a long waiting time of several years before delivery. This enterprise, Maruti Suzuki subsequently brought about a churning and a revolution in India's automobile story.

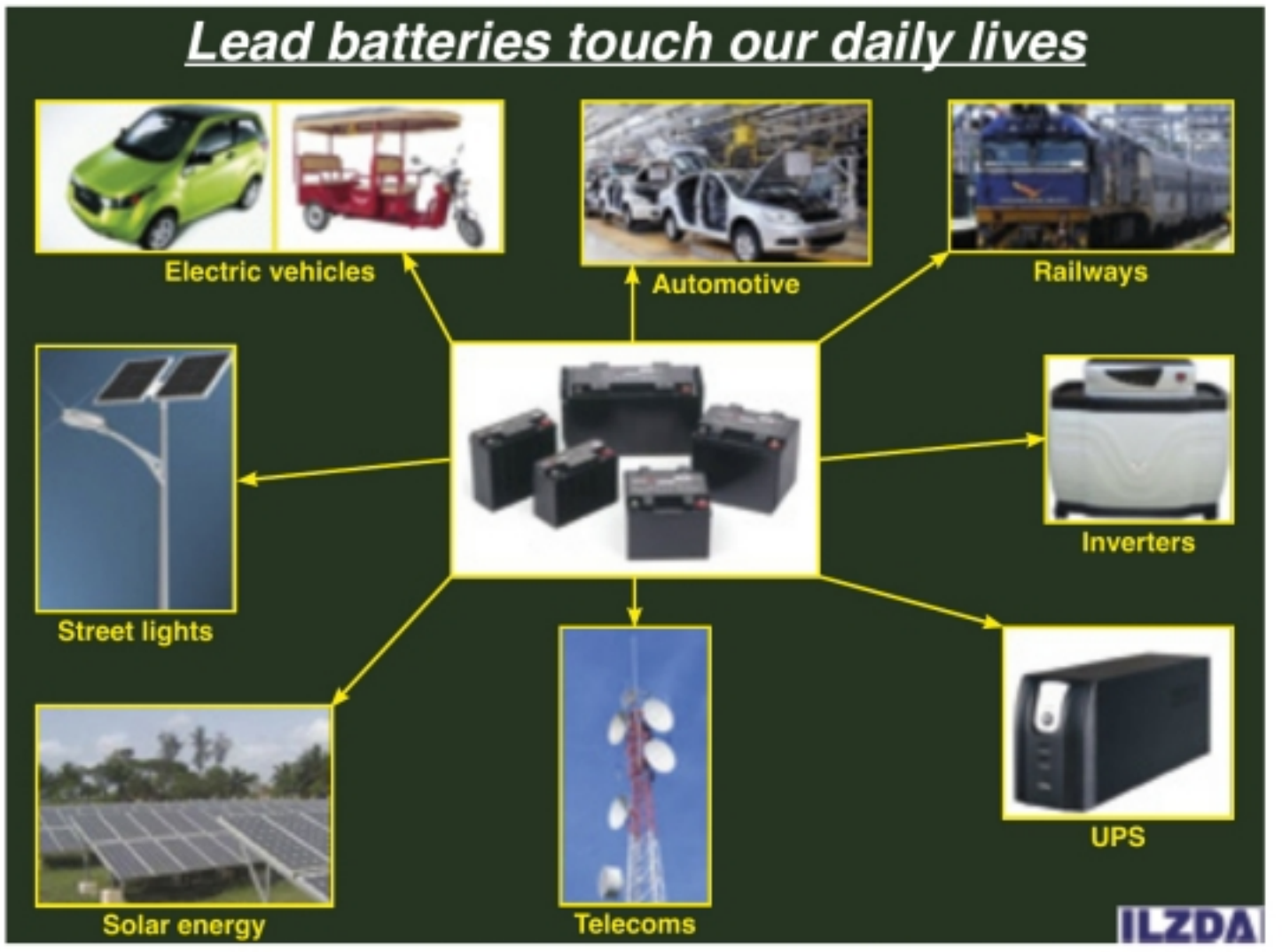

Fig 1: Lead battery and applications

Battery and applications

Today India has all the well known global players in the automobile segments such as passenger cars, commercial vehicles, two and three wheelers, SUVs, buses, trucks, tractors etc. A few years ago, India displaced Germany as the fourth largest automobile producing country in the world and is poised to become No.3 in the coming years. Severe power cuts during the summer months across the country resulted in the rapid growth of lead battery powered inverters as energy backups. This has been followed by the arrival of the computer era

which again led to the massive penetration of lead battery powered UPS. Mobile phones brought along the necessity of telecom towers, at the base of which you have a bank of lead batteries in air-conditioned cabins. Lead batteries are also used in railway coaches, defence communication, submarines etc.

After the 2015 United Nations Climate Change Conference in Paris, France, India is investing heavily in the renewable energy space, both solar as well as wind, where lead batteries will be used for energy storage purposes. In order to meet the fresh challenges due to climate change as well as to bring down the imports of crude oil, India has recently launched the National Electric Mobility Mission, by which electrification of vehicles will be accelerated; the lead battery powered e-rickshaws and electric two wheelers will see a rapid growth in the coming years. As a result of all the above developments, lead-acid batteries practically touch our daily lives in several ways ***(Fig 1)***.

Lead consumption

Approximately 85% of the lead consumed in India goes for manufacturing lead-acid batteries. The current lead battery market size is estimated at $7 billion. At present India's consumption of lead, as per industry estimates, is put at 1.2 million tonnes of which about 225,000 comes from primary lead produced by Hindustan Zinc. About 800,000 tonnes of lead comes from the secondary lead industry, both formal (70%) as well as informal (30%). The balance accounts for imports by India.

Crude Smelting

From the sixties, India was recycling used lead batteries—though very small quantities, in a crude manner— with low recoveries and more emissions, due to lack of appropriate technologies as well as environmental awareness. Because of the serious environmental and health risks, the Supreme Court of India banned imports of used lead batteries and other hazardous wastes in 1996. As a result, the lead battery sector as well as the lead industry were in doldrums affecting transport, power, telecom, defence, railways etc.

Legislation and Green Recycling

In order to help the ailing lead industry, ILZDA organised an 'International Conference on Lead and Zinc Recycling – Technology and Environment' in Delhi on 17-18 Dec 1998. The conference deliberations decided to create an appropriate framework for ensuring a 'close loop' arrangement for an effective collection and environment-friendly recycling of used lead batteries. As a result the Ministry of Environment and Forests (MoEF), government of India setup a 'core group' of various stakeholders, including ILZDA, to identify the required actions and strategies in India's interest. This ultimately resulted in the following steps:

1. Regulating lead battery auctions
2. Launching Battery (management and handling) Rules 2001
3. Registration of eco-friendly lead recyclers
4. Strict implementation of the norms and rules
5. Monitoring/fine tuning for improvement

In the earlier years, the auctions by bulk consumers were attended by middlemen, scrap merchants etc, and they were picking up the used lead batteries and feeding informal or backyard recyclers. Therefore, the new regulation stipulated that only registered/authorised lead recyclers could participate in such auctions (dissuading the middlemen, traders etc), so that the lead recyclables went to the eco-friendly recycling units only.

Extended Producer Responsibility

After a series of 'CORE GROUP' meetings for two years, the MoEF brought out 'Battery (Management and Handling) Rules 2001' B(M&H)R, which included 'Extended Producer Responsibility' and covered all stakeholders such as manufacturers, dealers, importers (of new batteries), battery assemblers, reconditioners, auctioneers, individual consumers and bulk consumers; the main aim was to collect the old battery against the sale of the new battery on a 'one-to-one' basis and to ensure that they were all processed by registered eco-friendly lead recyclers only. B(M&H)R also mandated that battery manufacturers should file returns with the State Regulatory Boards on the

number of old batteries collected as well as new batteries sold. State Regulatory Boards were requested to send these returns to the MoEF so there was a clear picture on the national inventory. The B(M&H)R also encouraged setting up collection centres across the country for used lead batteries. The battery collection targets fixed in the rules were:

Year 1 (2002) : 50%
Year 2 (2003) : 75%
Year 3 : 90%

Ultimately the aim was India should collect back 100% of used lead batteries and send them for environment-friendly recycling only.

A registration or authorisation committee consisting of experts including ILZDA, which used to go through the applications of lead recyclers, visit the plants for effecting improvements and finally gave registration/ authorisation to such eco-friendly units, on a case-to-case basis. Units using blast furnaces, which showed leakages here and there, later on shifted to close door operations like rotary furnaces ***(Fig 2)***.

Dealer Registration

Even after the implementation of the B(M&H)R, the backyard lead recyclers were thriving and active because the battery dealers were diverting the collected batteries to the traders and backyard recyclers. In order to check this trend, the battery dealers in the country were asked, through an amendment in 2010, to get themselves registered with the respective State Regulatory Boards and to file returns. The returns would indicate the number of batteries sold as well as collected batteries and also its pathway, i.e, they are being sent to registered environment-friendly recyclers only.

Fig 2: Recyclers shifting to rotary furnaces

Likewise, all the importers of new lead batteries were also mandated, through the same amendment in 2010, that they should also get registered with the State Regulatory Boards and file returns providing information on the number of batteries imported as well as collected; and sending the collected old batteries to the registered lead recyclers only. In the same year, 2010, MoEF/ Central Pollution Control Board shifted the responsibilities of the Registration Committee for Hazardous Wastes to the State Pollution Control Boards, for implementation at the state level.

Way Forward

India has introduced an excellent package of initiatives for an organised collection and environment-friendly lead battery recycling. From now on, we should take those initiatives to their logical conclusions by taking the following measures:

- Voluntary industry initiative
- Strict enforcement/monitoring by State Regulatory Boards
- Focus dealers and importers
- Dissuade role of traders
- Tighten backyard smelting
- Encourage collection centres
- Stringent customs clearance (imports)
- Continue awareness programs
- Provide incentives for green recycling
- Introduce cleaner recycling technologies
- Implement occupational exposure precautions
- Recognise and motivate clean operators

The above measures should make India a country capable of adopting green technologies for the organised collection, safe storage and transportation as well as eco-friendly lead recycling, in the true spirit of Sustainable Development.