

THE LEAD/ACID BATTERY INDUSTRY IN INDIA

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Introduction

Efforts to manufacture lead/acid batteries in India commenced in the early part of this century; the requirements till then were met by imports. Organized manufacture on a significant scale really started after the Second World War. The decade 1947 - 1956 can be said to have witnessed the establishment of the Indian battery industry. The following three decades saw steady growth and development to meet the local demand for batteries. Expansion in both the product range and production capacity has kept pace with market needs. Today, the Indian battery industry exports nearly 15% of its output to different parts of the world.

Environment

The lead/acid battery industry in India, like all other industries, has developed within the government's industrial licensing policy and the size limitations of the local market. It has also enjoyed the benefits of an unusually high proportion of scientific human resources.

In India, the manufacturer in the organized (large scale) sector is required to obtain: (a) an industrial licence to produce lead/acid batteries; (b) permission for collaboration with foreign companies and the import of "know-how". The government's policy also strongly encourages small scale activities, and this approach has been consistently pursued over nearly three decades. The import of know-how is permitted only when indigenous technology is not available. Exceptions are made, however, when either huge export potential is perceived or the know-how imported is expected to have a dramatic impact on quality, unit cost, and the opportunity to catch up with overseas developments in battery technology.

The lead/acid battery manufacturers have a protected market. Imports of batteries equivalent to those manufactured within India are banned. The remaining imports are severely restricted and are permitted only when necessary on the grounds of national defence, health or priority. Against this market backdrop, heavy import duties are imposed on imported raw materials, and excise duty is levied on production. The scale of production is often not conducive to achieve economy in cost. The prices are therefore high and

have the effect of depressing the demand. Licensed and installed capacities involve considerable time-lag. In many instances the installed capacities suffer from low utilisation. All these factors cause both cost and price escalation. Supply and demand rarely ever balance

Before 1956, opportunities for foreign companies to obtain licences were unrestricted. Since that time, the government has introduced restrictions. From 1973, foreign investment has been normally permitted only when the foreign equity has been less than 40%. Exceptions are made, however, on a negotiated basis in the case of sophisticated technology and export-linked propositions

Industry size mix

At present, lead/acid battery manufacturing units are found in the small-scale, the medium, and the organized (large) sectors. In the small-scale sector, there are battery reconditioners and battery assemblers; only a few of these have manufacturing facilities. The manufacturers obtain battery components (e.g., pasted plates, containers, separators, connectors, etc.) from well-developed units in the large, the medium or even the small-scale sectors. In the medium sector, some components are produced in the units themselves while some are procured from component manufacturers. In the organized (large) sector, facilities exist for manufacturing all components, as well as for battery assembly and testing

Small- and medium-scale sectors

Nearly 200 small-scale manufacturers of lead/acid batteries are spread throughout the country. There are more than 3 500 lead/acid battery assemblers and rebuilders. In addition, over 200 battery component manufacturers exist, specialising in plate making, containers, separators, etc.

In the medium sector, there are six manufacturing units that enjoy a good image in the market for the quality of their products. Table 1 lists these together with their location

TABLE 1

Medium-scale lead/acid battery companies in India

Company	Location
The Bharat Battery Mfg Co (P) Ltd	Calcutta
Sahni Batteries (P) Ltd	New Delhi
Embee Super Batteries (P) Ltd	New Delhi
Premier Battery Corporation	New Delhi
Spark Battery Corporation	Bombay
P Kishor and Co	Calcutta

Large-scale units

All six of the lead/acid battery manufacturers in the large-scale sector have enjoyed foreign collaboration for some considerable time. Some collaboration is still valid and continues. Some has lapsed and fresh collaboration agreements have been negotiated. Table 2 lists the manufacturers concerned, together with the number of their manufacturing units and the companies with whom they collaborate. Technology from Japan, Sweden, U.K., U.S.A., and F.R.G is being utilized in these units

In summary, it can be seen that the lead/acid battery industry in India is broadly based and has a wide spectrum of operating sizes. By comparison with the average scales of operation necessary for the economic introduction of established, high productivity technologies from overseas countries, the installed capacities of Indian units, even in the large-scale sector, are far too low. This situation acts as a deterrent to investment in high productivity equipment.

TABLE 2

Large-scale lead/acid battery companies in India

Company	No. of units	Collaborator
Chloride India Ltd (Calcutta)	4	Chloride Group Ltd, U K. (since 1947)
Standard Batteries Ltd (Bombay)	2	(i) Oldham Batteries, U.K. (ii) Aktiebolaget Tudor, Sweden (since 1950)
Amco Batteries Ltd (Bangalore)	2	(i) Gould Inc., U.S A (since 1955 now expired) (ii) Yuasa Battery Co. Ltd, Japan (since 1985)
Willard India Ltd (New Delhi)	1	(i) Electric Storage Battery, U.S.A. (ii) Japan Storage Battery Co , Japan
UB-MEC Batteries Ltd (Bangalore)	1	Sonnenschein AG, F.R.G
Nicco Batteries Ltd	1	Globe Union Batteries, U S.A.

Licensed and installed capacities

Table 3 details the approximate licensed and installed capacities, as well as the annual production, of large units. The relevant year for production is also indicated. The total licensed and installed capacities are approximately 3.4 million and 2.4 million batteries, respectively.

TABLE 3

Capacity and annual production of lead/acid batteries by large-scale manufacturers in India

Name of the unit	Capacity ($\times 10^6$)		Production ($\times 10^6$)	Year
	Licensed	Installed		
Chloride India Ltd	1.6	1.1	0.9	1983 - 84
Standard Batteries Ltd	1.0	0.9	0.34	1982 - 83
Amco Batteries Ltd	0.3	0.24	0.16	1982 - 83
Willard India Ltd	0.32	0.20	0.17	1983 - 84
UB-MEC Batteries Ltd	← Not available →			
Nicco Batteries Ltd	0.2	To be commissioned in 1987		
Total	3.42	2.44	1.57	

The continued production in the medium and small sectors is estimated to be about the same as that of the large scale sector

Product range

While the large-scale sector has a spectrum of products to meet the industrial demand for different service requirements, the small-scale sector concentrates predominantly on SLI types. The large-scale sector meets the entire demand for the original equipment (OE) market as well as part of the replacement market, the small-scale units produce most of the replacement demand of SLI types. The medium-scale sector has a small range of products and serves both OE and replacement markets. The range of lead/acid products manufactured in India is given in Table 4.

TABLE 4

Lead/acid battery product range in India

Light and heavy duty automotive batteries for cars, trucks, etc. Very recent addition is 'light-weight' car batteries for the 'Maruti-Suzuki' cars

Motive power (traction) batteries for materials-handling trucks, tractors, mine locomotives, electric vehicles, etc

Stationary batteries for electric utilities and metro, telecommunication, emergency lighting, standby power systems, nuclear power plants

Train lighting, locomotive starting, signalling and telecommunication batteries for the Indian Railways

Batteries for miners' cap lamps, marine duty special cells, submarine batteries, defence vehicles, ground starting of aircraft, on-board aircraft operations, etc

Sealed lead/acid batteries in 2.6 - 10 A h range

Product value

The annual sales turnover of the lead/acid battery manufacturing industry in the large-scale sector is approximately Rs 1.35 billion. There are no accurate figures for the medium and small sectors; however, a reasonable estimate for the combined turnover would be Rs. 1 billion.

Export

On average, 14 - 15% of the lead/acid batteries produced in India are exported. Approximate export earnings for the six years to 1983 - 84 are shown in Table 5.

TABLE 5
Export earnings of the lead/acid battery industry in India

Year	Value ($\times 10^6$ Rs)
1978 - 79	109 1
1979 - 80	141 5
1980 - 81	145 0
1981 - 82	125 0
1982 - 83	132 0
1983 - 84	101 8

Automotive statistics

Approximately 49 million motor vehicles were registered in India between 1951 and 1983, inclusive of two wheelers, cars, jeeps, taxis, buses and trucks. The fleet strength of nationalised road transport undertakings is approximately 83000. Total registered vehicles are 6.72 million including two- and three-wheelers. Excluding these, the motor vehicle population is about 3.00 million. These figures are as at the end of March, 1983.

TABLE 6
Vehicle production in India

Vehicle type	Production	
	1983	1984
Passenger cars	45090	64013
Commercial vehicles	87365	94660
Jeeps	21660	22246
Tractors	71543	78867

TABLE 7

Estimate of vehicle demand in India for period 1985 - 90

Year	Commercial vehicles		Cars	Jeeps	Total
	Heavy & medium	Light			
1984 - 85	75 000	31 000	80 000	28 000	214 000
1985 - 86	82 000	37 000	91 000	31 000	241 000
1986 - 87	91 000	44 000	104 000	34 000	273 000
1987 - 88	100 000	52 000	118 000	38 000	308 000
1988 - 89	110 000	67 000	135 000	41 000	353 000
1989 - 90	120 000	75 000	154 000	45 000	394 000

The annual production of motor vehicles in the years 1983 and 1984 is given in Table 6. Demand estimates for motor vehicles for the period 1985 - 90 are shown in Table 7. Requirements for both OE and replacement SLI batteries are poised for good growth.

Other battery-user sectors

An expansion is expected in each of the other industrial sectors requiring lead/acid batteries, *i.e.*, materials-handling trucks, tractors, mine locomotives, electric vehicles, UPS for computer installations, telecommunications, electric utilities, emergency lamps, railways, defence vehicles, marine duty special cells, aircraft, submarine, miners' caplamps, etc Thus, the lead/acid battery industry in India is expected to register a spectacular annual growth rate

Technology status

The lead/acid battery industry has depended on imported technology and collaboration still takes place. Indigenous development efforts are presently minimal, and are confined to some large-scale manufacturing units and to the Central Electrochemical Research Institute (a laboratory under the control of the Council of Scientific and Industrial Research) which has a division devoted to the study of all battery systems

Grids are produced predominantly by manual gravity casting. The grid alloy is lead-antimony, containing between 3.5 wt % and 6 wt % antimony. Some large-scale manufacturers have attempted to use grid alloys with less antimony. Use of ball-mill and Barton oxide as active material is gaining ground fast, except in small-scale units. Both flat pasted and tubular plates are produced, depending on discharge requirements. Microporous PVC separators are favoured by the majority of manufacturers. Other advanced separators have yet to be introduced. Hard rubber containers are in common

use, though some large-scale units employ polypropylene containers. Short, low resistance, inter-cell connectors that improve battery performance and are material-effective are used by many companies.

Lead and lead oxide

The Indian battery industry accounts for 40 - 45% of the total consumption of lead in the form of grid alloys and lead compounds. While large-scale units are moving toward thinner grids, other sectors are not so material-effective in the design of grid alloys.

Some large-scale units have their own ball-mill oxide facility. There are some independent Barton oxide manufacturing units that have been established to meet the needs of the battery industry.

More than 50% of the lead consumed in India is imported. There is a secondary lead industry in the organized sector that accounts for about 10% of the metal. There is a "backyard", small-scale, lead recycling industry whose size is not precisely known, but it is considered to be quite substantial.

Development

Although technology absorption in large-scale units is quite satisfactory, the development of new and innovative technology and design is yet to occur. Light-weight SLI batteries to meet the OE demands are now made in India. Some medium and small units are already gearing themselves to meet the replacement needs for such batteries.

Maintenance-free (MF) batteries are not yet manufactured in India, neither are they imported. This is because the local automotive market is almost totally based on d.c. generators. Charge control devices are also poor. The use of MF batteries is justified only with alternators and advanced charge-control devices. There is little research/development effort being conducted on MF batteries for SLI service, but some work is being carried out on industrial applications. The lead-calcium and lead-calcium-tin alloys (with aluminium) that are used in MF batteries are difficult to work with the equipment currently installed in Indian companies. Changing this equipment would require large capital expenditure which the market does not justify. The present charging facilities are not sophisticated enough to cope with MF batteries.

The Battery Society of India

The Battery Society of India (BSI) has been functioning since 1983 as an affiliated body of the Indian Lead Zinc Information Centre. The BSI is a technical forum that periodically brings together battery manufacturers,

users, inspectors, scientists, etc., to present and discuss developments within the industry. These meetings are organized as a Battery Technologists Forum (BTF). The scope of BSI is not restricted exclusively to the lead/acid field. There are over 60 corporate members of the BSI and nearly 75 technologists are members of the BTF

Conclusion

The lead/acid battery industry in India is fast maturing and is expected to undergo tremendous growth and development in the next few years.