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The European lead/acid battery industry

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Abstract

The European lead/acid battery industry is examined from a general perspective that covers wider economic, industrial and technical issues. It would appear that the upheavals witnessed in Eastern Europe two years ago together with the more recent political and monetary events throw two points into sharp relief: first, the merely relative value of general speeches, that are liable to sound technocratic and out of touch with the realities of the world; second, the need for an industrialist to be able to stand back and view things from a distance. Given this background, the review is divided into four parts, namely: (i) general remarks about Europe; (ii) the wider context of the lead/acid battery industry; (iii) changes in demand; (iv) structural changes in market supply. Finally, a number of observations are made about the key issues that will prove decisive for the future of battery manufacturers in Europe within the context of a rapidly changing environment.

General remarks about Europe

First, what does the word 'Europe' actually mean in political and economic terms? There are two basic entities, namely: (i) 'free-market' Europe, or Western Europe, with its two economic communities: the EEC (European Economic Community, with 342 million inhabitants) and the EFTA countries (European Free Trade Association, including Iceland, Norway, Sweden, Finland, Switzerland and Austria, with 32 million inhabitants), and (ii) the former socialist Europe, that now comprises Central Europe, or 'Mittel Europa': 7 countries and 123 million inhabitants divided between Northern Central Europe (Poland, former Czchoslovakia, Hungary) and Southern Central Europe, and the former USSR (the 3 Balkan states and the Commonwealth of Independent States, CIS, with 280 million inhabitants).

Two contradictory trends have emerged: (i) a growing integration of markets within the European Economic Community whose founding treaty (the Treaty of Rome) was signed 36 years ago and even then provided for the free circulation of labour, goods and capital and for which 'Maastricht' represents a new step forward with, amongst other things, a single currency and a strengthening of political cooperation, and (ii) a growing rift between the former communist regions leading to the erection of new barriers of an economic, political and, perhaps, even commercial nature.

The current debate is of vital importance and a great deal remains uncertain. Nevertheless, with respect to the battery industry, a greater competition is anticipated. In addition, major and constantly growing preoccupations with regard to the environment will weigh heavily upon the necessary capital expenditure.

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Changes in the business practice of battery manufacturers

Increased competition

For the past decade, the price of lead/acid batteries has remained stationary in real terms. In other words, gains in productivity each year have had to offset the increases in costs that are due to inflation. No immediate end to this tendency is in sight. On the contrary, it is probable that the downward pressure on prices shall become even stronger.

'Clean' factories

Public concern for a clean environment is growing all the time. As a consequence, increasingly stringent regulations will oblige manufacturers to respect ever more demanding standards that govern atmospheric emissions, liquid effluent and the dumping of solid waste. It should be emphasized that the introduction of these regulations, as derived from EEC Commission Directives, must not interfere with the rules of free competition.

Recycling

Used batteries, given the lead and acid contents, are a major potential source of pollution. Battery manufacturers will be required, under pressure from the authorities and public opinion, to become increasingly involved with the recycling of used batteries. This suggests action (either taken individually or on the basis of partnership agreements) to contribute actively to the:

- creation of recovery facilities that are both environment-friendly and cost-effective
- reprocessing of used batteries through the production of recycled lead and plastics
- use of increasingly larger quantities of recycled lead, plastic and, in general, waste products in the design and manufacture of batteries

Only financially-sound and well-structured groups will be capable of meeting these challenges that the battery industry must face over the next decade.

Changes in demand

Technical changes in the products

It is essential to analyse the technical changes that are likely to occur in the three main market sectors of lead/acid batteries.

Automotive batteries

The development of automotive batteries will take place under the influence of the car manufacturers. The main constraints expected, and the solutions envisaged by the battery manufacturers, are presented in Table 1.

With modern vehicles, two main factors should be taken into consideration, namely: (i) the reduction in space under the streamlined bonnets and the increase in temperatures around the engine, and (ii) the increase in consumption of electricity due to the greater number of accessories.

Possible solutions to these problems include the development of either enhanced-performance batteries or twin batteries. With the latter concept, one battery is used for starting the engine, the other for powering accessory equipment.

Traction batteries

Electrical traction will be used more extensively. Furthermore, its applications will become increasingly diversified compared with the current preponderant use in

TABLE 1

Anticipated technological development of lead/acid batteries

Automotive requirements	Answers
Temperature under the bonnet	Development of low-corrosion alloys Cooling system
Limitation in volume and weight	Improvement of mass and volume energy density
Increasing energy consumption	Systems with two separate batteries, one for starting and one for accessories, can help to save space under the bonnet
Maintenance reduction	Maintenance-free design and sealed valve-regulated batteries
Reliability	Utilization of continuous process Integrated quality-control systems
Easy recycling	'Green battery' marketing
Traction	Movement from standard cells towards: low maintenance (one year maintenance free) valve regulated (completely maintenance free) Monitoring of charging and discharging Development of monobloc applications: e.g., fork-lift trucks, sweeping and scrubbing machines, small vehicles
Stand-by	Movement from vented cells towards valve-regulated cells Monitoring of charging and discharging of battery systems Development of products adapted to specific applications

fork-lift trucks. (Table 1). Small cars, wire-guided trolleys, cleaning machines, etc., will all be users of traction batteries in ever-increasing numbers.

Stand-by batteries

This market segment is characterized by an extremely wide variety of different applications. It is considered that the use of sealed batteries will grow. Electronic control systems will be in much wider use and will be much more sophisticated. Increasingly, products will be designed to satisfy specific applications (Table 1). The competition with rechargeable nickel/cadmium and other batteries will intensify in the market for small batteries, as power requirements decrease, because of the application of electronics with lower energy consumption.

Changes in the customers

Although the customers for automotive, traction and stand-by batteries are extremely different, certain underlying trends can be discerned. These are:

- the importance of service is growing constantly, both for automotive batteries (just-in-time supply for car manufacturers, tailor-made delivery, ever shorter response times, cooperation in stock management with major customers, etc.) as well as for industrial batteries
- customers tend to view batteries as 'commodities', i.e., as a commonplace product of faultless quality that is available when and where the customer wants it

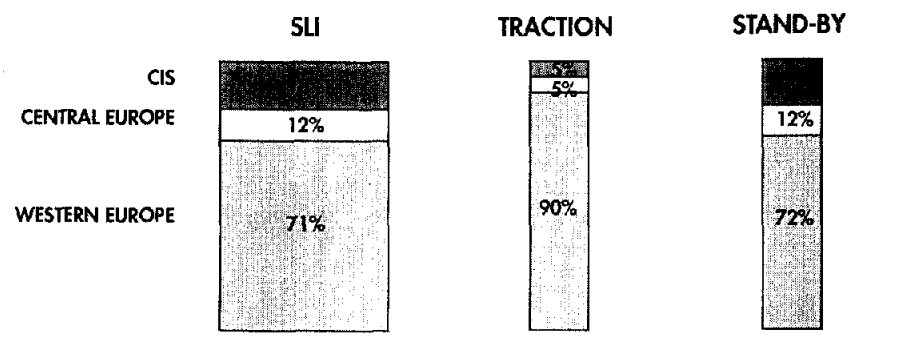
Changes in market

As usual, a market forecast allows for no major disruption in the economies in question. Figure 1 shows the respective market shares for Western Europe, Central Europe (or 'Mittel Europa') and the former USSR (or CIS). The estimates for the last two geographical regions are, of course, more uncertain than those for Western Europe for which the statistics are more reliable. In general terms, for Central Europe (i.e., from Poland to the former Yugoslavia), the countries are more or less self-sufficient as far as production is concerned. Improvements in productivity and quality depend mostly on what investments are granted. This is particularly true for Poland, the former Czechoslovakia, and maybe even Hungary, following the decisions made by major manufacturers of motor vehicles such as Fiat, Iveco and Volkswagen, General Motors and Suzuki.

As far as the former USSR is concerned, demand for automotive batteries undoubtedly exceeds supply by at least 20 to 30%. More so than in other countries, however, the future is by no means clear for foreign investors in the absence of both funding sources and clearly identified leaders with whom negotiations may be conducted.

Figure 1 also shows an analysis of the different types of market within the context of economic stagnation in Western Europe in 1992, followed by a moderate recovery in 1993. For the automotive (SLI) battery market, it should first be noted that for 375 million inhabitants in Western Europe, there are about 150 million vehicles on the roads, whereas in former Eastern Europe, there are only 30 million vehicles on the roads for 400 million inhabitants. The rate of car-ownership is more than 8 to 1 if Western Europe is compared with the former USSR, and about 3 to 1 if Western Europe is compared with the western part of Central Europe (i.e., Poland, Hungary, and the former Czechoslovakia). With total battery production estimated at 68 million units in 1992, Western Europe accounts for 71% of the total, Central Europe for 12%, and the former USSR for 17%. The growth rates in these three regions for the next few years are, on average, 2, 6 and 3%, respectively.

With respect to the traction battery market, the difference is even greater than for automotive batteries in the number of 2 V elements that are produced. Western



	Million batteries	+ per year	000' cells	+ per year	Million US $	+ per year
WESTERN EUROPE	48.3	+ 2%	4580	+ 3%	560	+ 3%
CENTRAL EUROPE	8	+ 6%	260	+ 8%	90	+ 5%
CIS	12	+ 3%	260	+ 8%	130	+ 2%
TOTAL	68.3		5100		780	

Fig. 1. Forecast of European lead/acid battery market.

Europe accounts for 90% of the total, Central Europe for 5% and the former USSR for 5%. The estimated growth rates per annum for the near-term are 3, 8 and 8%, respectively. The figure for the countries in Central Europe is quite firm as there should be a relative recovery in the sales of capital goods.

As far as the standby battery market is concerned, the relative proportions are similar to those for automotive batteries. That is, Western Europe represents 72% of the total in value, Central Europe 11%, and the former USSR 17%. Annual growth rates for the immediate future have been estimated at 3, 5 and 2%, respectively.

In summary, all three battery markets should experience relative growth in the years to come but at different rates, i.e., marginal growth in Western Europe as opposed to stronger growth in Central Europe and the former USSR. It should be remembered that the latter forecast is made against a background of well-known problems, namely, announced privatization of state companies, over-manning in the production industry (in the region of 3 to 1), slump in industrial output, decline in purchasing power, etc. All these difficulties highlight the significant degree of uncertainty in the estimates for economic growth in the countries of Central Europe and the former USSR.

Changes in the supply-side structure in Western Europe

Trade barriers within the EEC have been coming down gradually for many years. At present, about 35% of the batteries of various types sold in one country are manufactured in another EC country, compared with a figure of about 10% in 1980. The major restructuring of the battery industry has resulted from: (i) the fierce competition between the different battery manufacturers for both replacement units and original equipment, a consequence of excess production capacity and the internationalization of the markets, and (ii) the presence of most of the car and goods vehicle manufacturers in the different countries. The manufacturers of fork-lift trucks and the users of standby batteries are in a similar situation.

In 1988, out of some 40 battery manufacturers in the European market, 18 companies accounted for 92% of the total value of sales. The four leaders, viz., VARTA, CEAC, Chloride and Tudor Spain, alone controlled 41% of the market (Table 2). By 1992, however, these 18 manufacturers had been reduced to a mere 10 companies that controlled almost 95% of the market. Among them, the four leaders – CEAC, VARTA, Tudor Spain and Hawker-Siddeley – account for 75% of the total sales. These developments have put the European lead/acid battery industry in line with its counterparts in North America and East Asia. The major alterations to the European lead/acid industry during the past two years are shown in Table 3.

The future of the lead/acid battery industry

The advantages of lead/acid batteries

Since the lead/acid battery industry came into being about 100 years ago, it is justifiable to ask if the product has not reached the end of its life cycle. Very few consumer goods that are one-hundred-years old are still in use today. One answer lies in the increasing demand for portable energy sources with economic growth, with mobility going hand-in-hand with this development. To satisfy this demand, Mendeleev's periodic table provides numerous possible galvanic couples, but very few of these

TABLE 2

Market shares of the main lead/acid manufacturers in Europe (1992 estimated: 3 billion US $)

1988			1992		
Manufacturer	Country	Market share (%)	Manufacturer	Country	Market share (%)
VARTA	D	18	CEAC	I/F	27
CEAC	F	8	VARTA	D	22
Chloride	GB	8	Tudor Spain	E	16
Tudor Spain	E	7	Hawker Siddeley	GB	10
Subtotal		41	Subtotal		75
Hawker Siddeley	GB	6	FIAMM	I	5
Magneti Marelli	I	6	Hoppecke	D	4
FIAMM	I	5	Deta	D	3
Nesté	SF	5	AC/Delco	USA	3
Bosch/Femsa	D	4	Lucas/Yuasa	J	3
Hoppecke	D	4	Jungfer	AUT	1.5
Sonnenschein	D	4			
Hagen	D	3			
Deta	D	3			
CFEC	F	3			
Lucas/Yuasa	J	3			
AC/Delco	USA	2			
Jungfer	AUT	1.5			
Tudor Belgium	B	1.4			
Total		92	Total		94.5

TABLE 3

The recent major restructuring operations in the European lead/acid battery industry

Hawker Siddeley	Acquisiton of Chloride Standby	1991
	Acquisition of Hawker Siddeley by BTR	1991
CEAC	Acquisition of 74.9% shares in Sonnenschein	1991
	Acquisition by Fiat of a 50.1% majority in CEAC	1991
	Transfer of Magneti Marelli Battery Division to CEAC	1992
Deta	Acquisition of Sonnenschein Portoguesa	1991
VARTA	Merger of starter battery activities with Bosch	1991
	Acquisition of Ceska Lipa SLI Plant	1992
Tudor Spain	Acquisition of 100% control in Nesté Battery	1992
Hoppecke	Acquisition of Zwickau Akkumulatoren Werke	1992

potential energy sources have reached commercialization to date. The lead/acid cell continues to offer considerable advantages over its nearest rivals. These advantages include the following.

- Mastery of the manufacturing process. The production of lead/acid batteries is based on well-known and well-mastered processes that are organized for mass production.

Manufacturers at the beginning of the century produced only a few automotive batteries per person per year compared with today's figure in the region of 10 000.

- Costs. For an equivalent amount of energy stored, the cost of a lead/acid battery is about 2 to 3 times less than its closest competitor, the nickel/cadmium battery.
- Availability of raw materials. Lead is a relatively freely-available metal, and is easy to recycle. At present, about 75% of the lead that is used is obtained from recycling. Sulfuric acid is a by-product of a great many other industries, notably the production of primary lead. The polypropylene used to manufacture the battery cases is abundant and also largely recycleable. Taken in isolation, the disadvantages relating to the use of lead/acid batteries, mainly the heavy weight and the length of recharging cycles, are not sufficiently important to justify substitution by an alternative battery system, at least in the immediate future.
- Criteria for the future. In an old activity, the companies that will prove capable of adapting and satisfying the needs of the market will have to focus on the following four factors:

(i) Innovation. Customer demand will focus increasingly both on products that correspond to specific applications (as is observed at present, particularly in the standby market), and on more high-performance products.

(ii) Service/quality. Batteries, in their three traditional market segments, i.e., automotive, traction and standby, are products that are increasingly becoming 'commodities' that must be available everywhere and of faultless quality. The battery is a product that the user tends to forget while expecting absolute reliability.

(iii) Price. A 'commodity', a widely-available product and an old product, is a product whose price tends to decrease in an environment that is characterized by substantial excess production capacity.

(iv) Environment. The need for 'clean' factories (i.e., no emission of pollutants) as well as pressure from public opinion tend to make manufacturers become responsible for their products throughout the entire life cycle, that is, from the initial design of the battery, to manufacture, marketing and recycling.

Concluding remarks

Taken together, launching of large-scale research and development programmes, production in large batches, and the provision of marketing and service across the entire continent will only be within the reach of 'large' companies. To put this into perspective, it is noted that the lead/acid battery market is a very small one, for example, it is about three times smaller in Western Europe than the market for disposable babies' nappies. Only a major commitment to capital spending, equal to 3 or 5% of annual sales, will result in the productivity gains required to be able to meet the competition and respect standards in environmental matters. Finally, a global vision must be taken of: first, the industry as a source of autonomous energy; second, the full integration (both upstream and downstream of the product itself) of the business processes that are involved; third, the present competition and markets, not only in Europe itself but also in other parts of the world.