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THE LEAD/ACID BATTERY INDUSTRY IN KOREA

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Development of the industry

The lead/acid battery industry in Korea is comparatively young. Its progress can be divided into five stages.

(i) *1940 - 1945* The setting up of a small automotive battery assembly plant by the Yuasa Battery Company of Japan. All components (plates, cases, lids, etc) were imported direct from Japan and assembled into automotive batteries for the local market

(ii) *1946 - early 1960s* Small companies reconditioned used batteries from American outfits. A few companies started manufacturing automotive and industrial batteries in a small-scale domestic industry with rather primitive methods of manufacture

(iii) *Late 1960s - mid 1970s* Some manufacturers commenced modernisation of their plants both by introducing new and more efficient machines and by adopting Japanese technology from the Yuasa Battery, and the Japan Storage Battery companies

(iv) *Mid 1970s - late 1970s* A rapid growth in both the production and the population of vehicles in Korea gave rise to a substantial increase in the domestic demand for automotive batteries.

(v) *1980 - present* A marked improvement in automotive battery manufacture and high export growth of these units to over 70 countries throughout the world. The great advances in product quality achieved during this fifth stage has enabled Korean battery manufacturers collectively to assume the full status of an "industry"

Battery manufacturing technology

In this discussion, the term "technology" refers to manufacturing procedures that are already in operation in other parts of the world The Korean battery industry has not yet reached the stage where, through research and development programmes, innovations and breakthroughs may be expected, *e g*, the discovery and use of new types of grid alloy Rather, the industry is heavily dependent upon the adoption of manufacturing technology from both Japan and the U S.A

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The first instance of foreign battery technology being utilised in Korea following the Second World War was the introduction from Japan in 1964, by the Hang Shin Battery Company, of manufacturing methods for stationary batteries Other major technology transfers since the early 1960s are listed in Table 1

Apart from the importation of technology, there were two other occasions that marked epochs in the development of the Korean battery manufacturing industry One was in 1980, when the successful change was made from hard rubber to plastic for the AS containers and ABS lids of stationary batteries in the 130 - 2400 A h capacity range. The other revolutionary event took place in 1981 with the use of lead–calcium alloys in both the positive and the negative plates of several types of upper - medium sized (*i e*, 1680 A h) stationary batteries This latter event was particularly welcomed by the local end-users who until that time had depended on imported products

Developments in quality control

Since the late 1960s, Korean battery makers have become more and more concerned with the quality control of their manufacturing methods. This concern was based on clear evidence that the economic success of the Japanese battery industry owed a great deal to quality control, the so-called TQC techniques These techniques were introduced into Korean operations not separately and independently, but rather together with the battery manufacturing technologies that the individual companies had imported from Japan (*e g*, Table 1) In transferring such technologies, Japanese companies usually made it a rule to also incorporate the techniques of TQC, 4S, etc

Although the TQC and 4S procedures are widely and intensively practised by most of the Korean battery manufacturers, the levels and the standards may vary to a large extent from one company to another, since the most important factor in this area is not the technique *per se* but rather the diligence with which its principles are implemented by the manufacturer in question In other words, it is not the manner in which quality control philosophies are transferred and taught, but rather the spirit in which they are received, that is the key to success. Despite differing levels of acceptance, TQC practice has played an important role in improving the quality of Korean battery products.

Korean battery industry cooperative

The Korean Battery Industry Cooperative (KBIC) was first established in 1972 under the Law of Small and Medium Industry Cooperatives to represent, protect, and foster the members of the Cooperative The KBIC

TABLE 1

Introduction of technology into the Korean lead/acid battery industry

Date	Technology	Overseas developer	Korean Company
1964 - 1967	Large-size (to 2000 A h) stationary batteries	Yuasa Battery (Japan)	Hang Shin Battery (now Global and Yuasa)
1969 - 1974	Automotive batteries	Japan Storage Battery (Japan)	Chinhae Battery (now Global and Yuasa)
1975 - present	General battery technology and capital involvement	Yuasa Battery (Japan)	Global and Yuasa
1977 - 1982 ?	Automotive batteries	Furukawa (Japan)	Namil Battery
1978 - 1982 ?	Half-wet-charged automotive batteries	Gould (U S A)	Korea Storage Battery

now consists of ten members (Table 2), some manufacture only industrial batteries, whilst some make batteries for cars, motorcycles and industrial applications.

TABLE 2

Members of the Korean Battery Industry Cooperative

Member	Product range
Dae Do Battery Co , Ltd	Industrial batteries
Global and Yuasa Battery Co , Ltd	Automotive, motorcycle, and industrial batteries
Il Sung Battery Co , Ltd	Automotive and industrial batteries
Korea Storage Battery Co , Ltd	Automotive, motorcycle, and industrial batteries
Kyung Won Industrial Co , Ltd	Automotive and industrial batteries
Nam Bang Limited	Industrial batteries
Namil Battery Co , Ltd	Automotive and industrial batteries
Sam Jin Electric Co , Ltd	Industrial batteries
Sung Bo Industrial Co , Ltd	Automotive, motorcycle, and industrial batteries
Union Battery Co , Ltd	Industrial batteries

Production capacity and battery sales

The total capacity of the Korean battery industry far exceeds the domestic demand Thus, overseas markets are sought There has been a slow but steady growth in both domestic and overseas sales during the past five years The increase in domestic consumption has originated from a steady growth in the car population by about 17% annually As the number of cars in Korea is still only 1 2 million, it is the author's opinion that the domestic requirements for batteries will grow at a similar, or higher, rate to that of recent years. The present rapid increase in the export of Korean cars (Table 3) will, of course, push battery sales to even higher values

The export of Korean batteries has been subjected to both advantageous and disadvantageous forces On the positive side, continued

TABLE 3

Car production in Korea

Year	Total production	Exports	Production capacity
1984	265 000	52 000	—
1985	381 000	123 000	—
End 1985			500 000
End 1986			900 000
1988			1 100 000 (forecast)

efforts, combined with appreciation in the value of the yen, have enabled the Korean battery industry to diversify its markets to over 70 countries, whilst at the same time increasing both the quality and the amount of exported products On the negative side, the industry had to undergo losses of markets as a result of various trade barriers being set by friendly countries, *e.g*, raising of duty tariffs and anti-dumping petitions

Trends in automobile production and sales

There are five automobile manufacturers in Korea, apart from agricultural and construction machine makers The automobile industry is younger than the battery industry, being less than 20 years old. But with favourable changes in the economic situation, the automobile industry has shown a sharp growth in the last few years. This has largely been the result of a growth in the domestic market, coupled with an increase in exports to Canada, U.S.A and Australia (Table 3).