

The Asian battery market—a decade of change

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Abstract

The Asian battery industry will undergo significant change over the next decade as it adapts to the enormous economic and technological pressures of our rapidly changing world. Europe and North America in recent years have seen significant rationalisation in battery manufacturing capacity and ownership for a variety of reasons. Into the future, Asia will be no exception, but the rate and magnitude of change may conceivably be greater than that already experienced elsewhere. Rationalisation in battery manufacturing plants will occur as a result of the establishment of super plants to manufacture batteries in order to improve the economies of scale and to facilitate the heavy investment in new capital and equipment that will be required to supply the newer technology battery types. The impact of 42 V automotive systems and valve-regulated lead–acid (VRLA) batteries will be influential on this scenario. It is expected that China, Japan, South Korea, and Thailand will feature heavily in the future Asian battery scene at the expense of some established countries and producers. The current state of the battery industry in Asia, factors driving change in Asia, and the likely implications for those companies that are currently manufacturing batteries in Asia or considering a future role in Asia within the coming decade are examined in this paper.

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Keywords: Asian battery industry; Battery manufacturing; Battery technology; Lead; VRLA; 42 V

1. Introduction

Europe and North America in recent years have seen significant rationalisation in battery manufacturing capacity and ownership for a variety of reasons. Looking forward, Asia will be no exception, but the rate of change will conceivably be greater than that already experienced elsewhere.

In this paper, the factors driving change in Asia are considered, as well as what might take place, and the likely implications for those companies that are currently manufacturing batteries in Asia or considering a future role in the region.

2. Asia in context

From a Western perspective, the complexity of Asia is often misunderstood. It is a highly diverse area. The individual countries that constitute “Asia” have vastly differing cultures, languages, geographies, populations, foods, climates, histories, economies and levels of development.

Economically, however, the region exhibits greater commonality. South East Asia has formed an economic zone called the Association of South East Asian Nations (ASEAN), which has 10 member countries: Indonesia, Thailand, Philippines, Malaysia, Singapore, Brunei, Vietnam, Laos, Myanmar and Cambodia. ASEAN has implemented an accelerated program of tariff reductions [1], with most trade being conducted at 0–5% within this year as shown in Fig. 1.

Tariff reductions alone do not make a free trade area, and therefore ASEAN member countries are committed to facilitating trade through the elimination of unnecessary barriers to trade, harmonisation of standards and measures, and simplified customs procedures thus ensuring a smooth flow of goods across borders. These factors will ensure an accelerated rate of change across the region.

A further potential major factor facing the region is the recent agreement by South East Asian nations and China to set up the world’s biggest free trade area within 10 years. This area would cover nearly two billion people. China already has trade with South East Asia worth US\$ 40 billion per year and is therefore in direct competition with goods (e.g. batteries) produced in South East Asia. Japan, who is not a member of ASEAN, is downplaying the proposal for a free trade zone.

China, now a member of the world trade organisation (WTO) is seen as the new economic power in the region,

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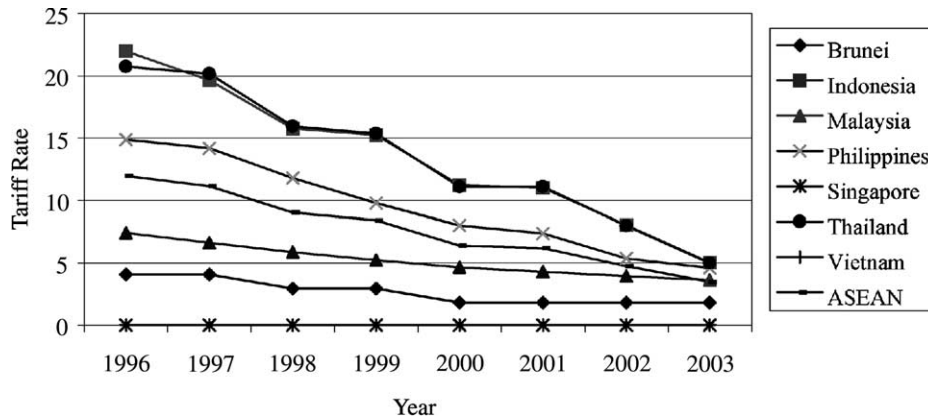


Fig. 1. ASEAN tariff reduction schedule.

usurping Japan’s previous role. WTO membership means that China will have to lift restrictions on capital markets and market access for foreign goods and China’s vast state owned industries will have to reform and this could lead to a huge rise in unemployment in the short term. Western companies will be free to set up joint ventures, and foreign investment will continue to flood in acting as a spur for major growth. China should therefore become even more competitive as an exporter to industrialised countries as private companies take advantage of the new open economy.

3. Batteries in Asia today

Lead–acid battery production in Asia has been dominated by product for motor cycle and automotive starter (SLI) applications but the small VRLA battery, once the domain of Japan and Taiwan is rapidly becoming of major importance in China. The adopted technology varies from predominantly full antimony products in India and the ASEAN block through a mixture of hybrid and full calcium product in Japan, South Korea, Taiwan and China. Japanese influence has been very high through many joint ventures throughout the ASEAN region and in Taiwan.

Significantly, with the exception of Taiwan it appears that the presence of Japanese joint ventures has had a negative effect on development. ASEAN in particular, is dominated by Japanese joint ventures but technology is that of yesteryear and export drive is virtually non-existent. In comparison, there is little Japanese influence in South Korea where production capacity continues to expand, latest technology is embraced, efficiency is high and a fierce drive for export markets is forever present.

Many parts of Asia benefit from a competitive advantage in the form of low labour rates and land costs, and lower environmental standards. Over time this advantage has been heavily diluted in some Asian countries as they have developed, for example, South Korea, Taiwan, Japan, and Malaysia.

There is a heavy reliance on low margin batteries in the region, with very little value added manufacturing at this

stage. A major threat to Asian battery manufacturers over the next few years, is that with profit margins having been squeezed to very low levels, future profitability is by no means assured. Battery producers have been able to respond in past years by lowering battery unit prices in an effort to secure volume, on the back of falling lead prices and premiums. When the lead market’s fundamentals eventually turn and lead prices again rise, some producers may fail if they are unable to pass on these additional raw material costs.

Fig. 2 shows that Asian SLI production at 90 million units as of year 2000 falls short of that of North America at approximately 105 million units and is significantly higher than that of Europe at approximately 60 million units. Numbers of batteries produced in Asia have not followed to date the sales of vehicles. Thus, at this stage there is not a simple relationship between battery life, vehicle population and battery consumption. This is because in some markets there are more automotive batteries used for off-road purposes than those used in road vehicles. This is however unlikely to continue into the future where growth in production will track vehicle production as well as increased export numbers.

Almost all motor cycle battery production around the globe takes place in Asia where Japanese designs dominate. Likewise the labour intensive yet low margin VRLA up to 25 Ah is also predominantly manufactured in Asia and exported far and wide.

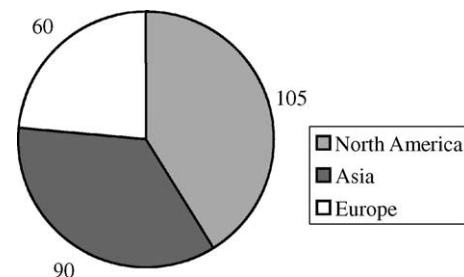


Fig. 2. Relative regional SLI battery production in 2000 (million units).

Looking at Asian battery manufacturing in a little more detail on a country by country basis:

- Japan—significant change has already commenced. The high value of the Yen has made domestic manufacturing relatively uncompetitive. In both the automotive and battery industries, Japan is struggling for profitability. Rather than rely on exports, a number of the vehicle manufacturers have either moved offshore or increased capacity offshore. This has reduced the number of batteries being exported as original equipment (OEM) in vehicles. Nevertheless, a significant number of batteries are still produced for OEM for vehicles in Japan. In regard to replacement batteries, now under heavy threat from South Korea and China, Japan has imported a significant number of around 5.2 million batteries in 2000. Five years ago there were no imports. Of course, although high cost producers, Japanese quality is excellent and the VRLA battery product is still a significant contributor to the strength of the industry.
- South Korea—a major exporter of SLI batteries to the world; 15 million in 2001. Exports were to a staggering 145 countries ranging from Angola, Italy, and Norway through to Paraguay, Qatar, and Zambia to mention but a few. The largest customer for Korean exports is Japan. The battery manufacturers are highly automated and have very efficient, modern production lines producing both hybrid and flooded calcium–calcium product. It could be said that they are currently using technology to its practical limits. Unlike many other Asian countries, there is little or no Japanese technical influence. Two major battery companies continue to increase production capacity. With the recent “Asian crisis” the vehicle manufacturers had suffered a decline in activity, although this did not directly translate into a major loss of production at the battery companies for any extended period. In regard to product mix, South Korea is predominantly an automotive battery producer. Labour content will remain high in the production of small VRLA product. To date, technological development has been unable to automate this area significantly. In general, small VRLA production will increase further in low labour rate countries (such as China) and eventually cease elsewhere.
- Taiwan—although automotive batteries are produced for internal consumption, the predominant product mix is now small motorcycle and VRLA which are exported in large numbers; 8 million motorcycle, and 15 million small VRLA in 2001. Significantly of these, 4 million motorcycle and 5 million VRLA went to the USA. The remainder were exported to 87 countries. Taiwanese battery manufacturing today is migrating into their ethnic homeland of Southern Mainland China where there is *guanxi* (family relationships); and commercial, language and cultural barriers are low, and the ratio of labour costs between Taiwan and China is almost 30:1. Eventually only the high-end products will be made in Taiwan.
- China—can be said to be the powerhouse of the future. China’s economy has seen sustained economic growth for last 25 years of 7–9% p.a. It has had the political will to take action to manage the economy effectively and is making the transformation from a centralised to a more free market economy well, although the transformation process is far from complete at this stage. There is a migration of manufacturing into China from Taiwan. There are Government incentives in the form of 3–5-year tax free periods and other tax concessions, in addition to cheap labour rates and land. The Chinese battery industry has a number of Western investors and technology exchange programs in addition to Japanese involvement and manufacturing migration. China’s battery industry has traditionally been centred around the needs of agriculture and transport, but in recent years has grown to cover the full spectrum of battery types, including significant small VRLA, motorcycle and SLI production. China produces the full spectrum of battery chemistries from high antimony through to calcium–calcium.
- India—the second largest population in the world after China is mooted to have tremendous potential, but there are many barriers to entry in the form of high customs duties and non tariff barriers on imported raw materials, and a highly protected local market so far. India has a very large “unorganised” battery sector (estimated at 60% of the local replacement battery market) that is largely beyond the scope of Government or corporate intervention. Ironically, battery exports are insignificant and in fact the industry is vulnerable to price competitive imports. Some environmentally unacceptable recycling practices prevail because of the large unorganised sector. The Government has realised this, but is unable to meaningfully intervene. Accurate statistics are difficult to obtain, but automotive battery production is estimated to be around 14 million units per annum today. As mentioned, many of these are products of the unorganised sector and are therefore of questionable quality and yesteryear technology. A small movement away from the old antimony technology has occurred, and is confined to three manufacturers in the main.
- Indonesia—has an advantage over some other South East Asian neighbours in the form of a large population and cheap labour force combined with a weak currency for exporters. Despite these facts, export percentages are relatively small. Internal battery demand is low per capita. Battery technology is largely antimonial, and has been slow to develop or change even though there are Japanese joint ventures in the larger plants. Production is mainly small motor cycle and SLI which are used for both automotive and off-road applications. In recent years there have been a number of rationalisations, and factory closures in the “second tier” manufacturers. A significant cottage industry exists in both battery manufacture and battery

recycling. This is akin to the unorganised sector in India, and unlike India, may not be sustainable into the future. Due to the large number of islands that comprise Indonesia, there is a significant but as yet untapped potential for remote area power supply (RAPS) applications.

- Thailand—is a minor exporter to Australia, Cambodia, Laos and Europe, and has a relatively small domestic market. With its low labour rates, Thailand is potentially a more significant exporter, but will require injections of capital and technology to achieve this. Automotive manufacturers are moving into Thailand due to its cheap labour force and political stability. Technology used is predominantly antimonial, and product is SLI and motor-cycle. Maintenance free (MF) production is in its infancy. Production is dominated by Japanese joint venture plants.
- Malaysia—with its relatively low population, small home market, and production plants typically small in size, Malaysia has been unable to attract Japanese investment in the past and is unlikely to be an investment choice into the future. Existing export markets will probably become increasingly less competitive over time. Malaysia has needed to import labour (from Bangladesh, Cambodia, Myanmar and Indonesia) to service its low technology manufacturing industries, and is moving away from “dirty” industries towards higher technology automated value added manufacturing. Companies are predominantly producing antimonial batteries, and some MF battery production is expected to commence soon.
- Philippines—has suffered a decline in manufacturing fortunes in the past decade resulting in significant rationalisation where currently there is only one manufacturer of any significance in operation. The level of technical expertise in the Philippines has been quite high, and hybrid products have been produced for many years. In addition, the major manufacturer has embraced expanded metals technology for negative grids. The Philippines has aggressively exported moderate volumes of SLI batteries mainly to Australia, North America, and the Middle East. It is unlikely that the Philippines will attract much foreign investment due to its ongoing political uncertainties and troubled economy.
- Vietnam—a very small market dominated by motor cycle production. It exports small volumes of SLI batteries to the Middle East, and neighbouring Asian countries. There are only three battery plants of any significance, with the largest one continuing to expand and moving to small VRLA production later this year. Because of its low labour cost, Vietnam has in one case attracted new manufacturing from Taiwan, and no doubt will attract further investment in time.
- Singapore—has moved away from “dirty” manufacturing industries, and also lacks cheap labour. Consequently, all battery manufacturing ceased completely in 2001.
- Cambodia—an emerging market with some small assembly operations being carried out for Thai manufacturers.
- Laos—as for Cambodia.

4. Batteries in Asia over the next decade

4.1. Market growth

It is expected that most economies in the Asian region will feature steady recovery. This will encourage a growing market demand for batteries driven specifically by motor cycle consumption, automotive consumption and infrastructure development. The latter spurring a demand for uninterruptible power supply (UPS) and telecommunications industrial batteries. Manufacturers will continue to lower production costs, which together with growing international product acceptance will stimulate further export growth. This production growth is shown in Table 1 for the SLI sector.

4.2. Factors driving change

4.2.1. The motor industry

Japan, South Korea and China will dominate the region’s vehicle production. However, production will rise sharply in China, will continue to rise in South Korea, but fall in Japan in part due to Japanese manufacturer’s decisions to move production offshore to places such as Thailand and China. China alone will account for one-third of total Asian sales growth through 2010. Sales of passenger cars will increase from 800,000 in 2001 to 3 million units in 2010 at which time China will be the world’s third largest vehicle market [2]. It is only a matter of time before China becomes the world’s largest vehicle market, and they will challenge foreign auto makers by offering low priced vehicles [2].

After some years of suffering, the South Korean auto industry seems more resilient than ever. Year 2001 saw production at 3 million units, more than half of which was exported. The South Korean industries’ future looks now to be assured.

In the ASEAN region it appears that Thailand has been selected as the production base for the future.

Table 2 shows Asian motor vehicle production growing from 16 million units in 2002 to 24 million in 2010. Registrations will climb from 130 million in 2000 to 200 million in 2010 resulting in battery demand growth from 100 million to 145 million per annum over this same period.

Table 1
Automotive battery production for Asia 2000–2010 (million units)

Country	2000	2010
China	15	28
India	10	18
Indonesia	8.5	11
Japan	23	20
Malaysia	2.5	4
Thailand	3.5	6.5
Taiwan	8.5	6
South Korea	15	21.5
Australia	4	5
Total	90	120

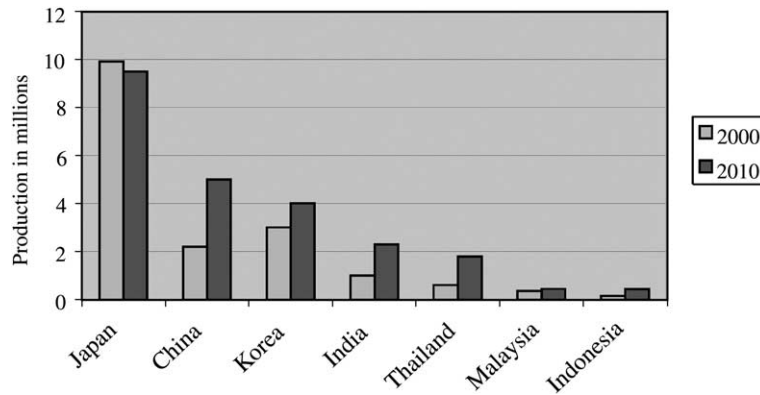


Fig. 3. Estimated vehicle production growth 2000–2010 [3].

Table 2
Vehicle demand in Asia 2000–2010 (million units)

	2000	2010
Production	16	24
Car population	130	200

Changes associated with the growth in Table 2 above are depicted in Fig. 3. During the next decade Japan, China, South Korea, India and Thailand will account for the bulk of Asia's new vehicle production.

4.2.2. The motor cycle industry

There are approximately 130 million motor cycles in Asia which is the most common form of affordable private transport with registrations broadly following population levels. Table 3 shows production of motor cycles at 18 million for 2000 growing to 30 million in 2010 by which time the total number registered will grow from 130 million to an estimated 220 million. This indicates a growth in motor cycle batteries from 80 million to approximately 130 million in 2010.

4.2.3. 42 V systems

The next 10 years will see a transition in vehicle technology which will require 42 V electrical systems to provide sufficient electrical power. Japanese battery companies are leading the way with the development of 36 V batteries and several have production capability already. Whilst these initial designs are reasonably conventional there is already pressure by the automotive industry to better contain the weight and cost increases involved. This will precipitate battery internal design changes, manufacturing methods,

Table 3
Motor cycle demand in Asia 2000–2010 (million units)

	2000	2010
Production	18	30
Motor cycle population	130	220

and will necessitate VRLA. These changes, which will require heavy capital investment, will in practice only be feasible in large to very large, and possibly even super plants. Smaller Asian manufacturers will have difficulties in accommodating the financial and technical investments required.

4.2.4. Technology

Arguably it could be said that battery technology development outside Asia has in the past 20 or so years declined significantly. However within Asia, battery companies in Japan, South Korea and China have continued to maintain or grow their investment in technology development, and it would appear now that the number of technologists significantly outweigh those outside the region. It is expected that this technological commitment will result in significant gains in world markets via product offering, improved productivity, and generally favourable costs. It will also allow companies to meet the challenges of 42 V demands.

With these demands on batteries changing quickly, there are clear warning signs for the industry in meeting future automotive designs through VRLA technology. What will this mean for lead–acid battery technology in practice?

- Basic VRLA battery designs are probably acceptable. What will need attention are the manufacturing techniques and processes.
- The technologies that are in place today, reflect practices formed over the last 100 years. New manufacturing techniques will be needed for the new 36 V/42 V batteries.
- Absolute reliability of the battery will be paramount as failure cannot be tolerated.

4.2.5. Costs and efficiencies

The Asian SLI industry will continue to be brutally competitive. SLI and small VRLA batteries are highly price competitive and increasingly becoming “commodities”. Once attractive margins 5 years ago have shrunk dramatically.

Product from Asia is now generally well accepted in world markets. However, there is heavy pressure on Asian battery producers to reduce already low prices even further.

Profits are low or non-existent. Quality could be compromised and in view of the demand for VRLA technology, Asia's reputation could be under threat.

Economies of scale and access to technology will drive investment decisions. The number of battery producers in Asia will fall, possibly dramatically, as a number of much larger scale plants replace the myriad of many family owned, and small publicly listed companies. Manufacturers will have to focus on benchmarking competition, levels of productivity, plant efficiencies, quality, and skilling of employees.

These super plants with access to capital and technology will drive many existing companies out of business in any case as demand moves away from simple SLI towards meeting the growing demand for VRLA and 36 V/42 V designs using high volume, high quality manufacturing techniques over the next decade. Super plants that will determine the fate of many smaller companies will take advantage of low labour rates, political stability (of selected countries), specific economic packages that will encourage local investment, less onerous environmental regulations, and of course the economies of scale that are implicit in such a plant that will enable competitive exports, both in terms of price and importantly quality.

4.2.6. The Asian free trade agreement (AFTA)

The formation and expansion of a broad Asian free trade zone, thereby allowing a free flow of commodities within the regional block will force manufacturers to devise new strategies away from country-based strategies to broader regional strategies.

The removal of protective measures will automatically favour low cost, reliable manufacturing centres such as Thailand, and China. New strategies will be required by battery producers to fully realise the benefits that this trade umbrella provides.

4.3. Future state—products and directions

It is apparent that into the coming decade, there will be a number of countries that are better placed to capture the transformation of battery manufacturing in Asia, due to factors such as existing infrastructure and technology, political will and stability, and attractive economic conditions. The view is that we are on the threshold of seeing Asia make the transition from many small companies to much larger units. Individual pockets of excellence will remain however in some markets despite the mounting pressures against them. There is still some time to go before we see the same concentration of ownership that we see in the United States of America, Europe or Japan today.

The likely “winners” in the coming decade are expected to be China, Japan, South Korea and Thailand:

- China—has an enormous and growing domestic market which should provide growth rates of 10–15% across all lead–acid battery products. The most accessible form of

personal transport will be by motor cycle which will provide a large local market for batteries. This will be in addition to a potentially large growth in motor vehicles in the major cities. Infrastructure development will require quite large volumes of both flooded and VRLA, Telecom and UPS batteries. Growth in domestic SLI will be large albeit from a low base, but China's cost advantages together with technical ability will ensure a very large export market in this product. China is already a significant exporter of small VRLA batteries. This will continue to increase at the expense of higher cost countries and the domestic market will also be significant. New investment is almost certain and will provide a multitude of battery plants immediately capable of calcium–calcium SLI and VRLA production.

- Japan—battery manufacturers despite the lack of domestic profitability, will continue to be influential in the region although a loss of some 15% in domestic production will occur over the period. New investment in selected joint ventures offshore will provide large growth in total battery production. This new investment will take the form of significantly increasing the percentage share holding in existing joint ventures, or the rationalisation of the number and size of its current involvement in Asia. Japanese commitment to technology, and research and development will ensure these selected joint ventures will be able to compete in the global market. Japan itself is a very large producer of SLI batteries, not only for internal consumption, but for export as OEM in new vehicles. Although no growth will occur in this sector, production will continue in the next decade at a high level.
- South Korea—with its existing huge SLI export market, significant local market, and competitiveness in both manufacturing technology and costs, it is well placed into the future. Because of the high labour content in small VRLA production it is unlikely that South Korea will be able to automate this to an extent that will make them competitive with China. It is expected that South Korea will continue to be dominant in world SLI markets, but have little effect in other battery products.
- Thailand—has been selected as the future South Asian regional centre by the major automotive producers. This in turn will guarantee a growing domestic market and export through OEM as illustrated in Fig. 4. Its natural low cost effective workforce combined with the country's stability ensures leadership in battery production under ASEAN's common tariffs. Japanese manufacturers have selected Thailand battery plants for further joint venture investment.

Growth in Asian production together with increased exports and some reduction of production in Western countries will create a situation where the Asian SLI production in the year 2010 will outnumber that of North America and very significantly that of Europe. A comparison can be made between Figs. 2 and 5.

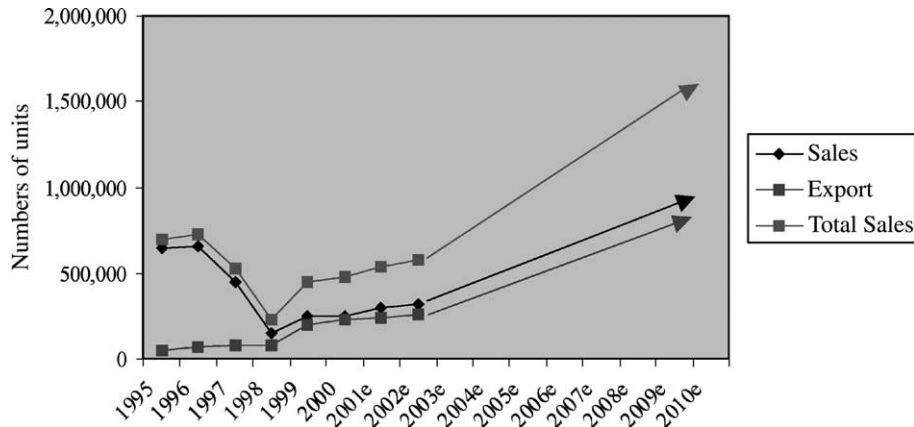


Fig. 4. Thailand automotive industry sales and export trend [4].

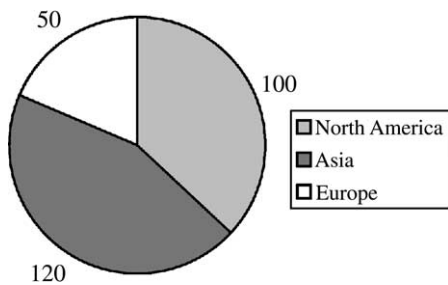


Fig. 5. Forecast relative regional SLI battery production in 2010 (million units).

5. Conclusions

Asian battery producers have been followers in technology and design. In the recent decade there has been little global innovation in production, performance or design of lead–acid batteries and the Asian industry has caught up. The Japanese Auto industry is leading the field with 42 V developments and will be volume producers by 2005. In close collaboration the Japanese battery producers are leading the way with 36 V battery developments and already have production capability. Producers in most of Asia have calcium–calcium capability, some have embraced expanded metal grid production and most are capable of producing batteries possessing adequate performance and service life.

Given a status quo in global technical development, by virtue of low labour rates and a strong work ethic, Asian battery production will eventually become dominant in the low priced relatively short life auto sector. Production outside Asia will decline drastically and experience a similar fate to that of the small VRLA battery sector where already European and American producers are unable to compete with the imported products.

Within Asia, China will likely dominate international battery production in both the SLI and small sized VRLA sectors, although the South Korean industry and Japanese joint ventures will grow super plants in order to compete.

Asia will continue to be under-represented in the large industrial battery sector which serves in the main the UPS and telecommunications industries and requires a service life of 12 years and more. Asia is unlikely to have the required credibility and back-up service in this sector over the coming decade. Consumption in this sector is expected to grow significantly and represents a unique opportunity for non-Asian manufacturers.

Acquisitions, mergers, and closures will occur. These will be driven in some cases by a lack of profitability as margins are squeezed to unsustainably low levels and in other cases by the formation and expansion of trade blocks, and harmonisation and removal of import tariffs, which will ultimately have the same effect.

Change is inevitable; some technological, some based on environment, some on tariffs and costs. The challenges from these changes can only be met by larger more sophisticated plants and this will result in yet more rationalisation. This will be most severe across Asia.

China, being a country with low labour rates and a strong talented workforce will meet all the challenges and become the dominant battery producer in Asia and beyond by the end of the first decade of the twenty-first century.

Japanese producers have long had significant influence in Asia with a large home base production and joint venture facilities offshore, most with minority shareholdings. Local production will continue to decline and investment will be confined to offshore facilities. The future will require significant investment and technological development and this will lead to Japanese acquisition of majority shareholding in selected joint ventures.

South Korean battery plants are the super plants of today for SLI batteries but rely heavily on export markets. At some stage during the decade they will likely hit a crisis, which should force the innovation necessary for survival. Potential problems could be associated with their heavy reliance on exports and possibly reduced competitiveness due to a stronger currency or increased competition. Despite the energy and determination of the Koreans, their plants cannot

hope to compete with Chinese producers using similar production methods.

Thailand is the only other production base likely to attract the necessary investment in plant and technology for significant production growth. Low labour rates and political and economic stability have seen the motor industry choose Thailand as a manufacturing base of the future. The battery industry is following and Japanese equity in joint ventures is already rising.

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