COMPOSITES 2005:

EUROPE AND THE MIDDLE EAST

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Overview

When does a market or industry become mature with the implications that profits are likely to be stable and the customer base large? Surely maturity occurs when a combination of factors is achieved including the following: large market size, multiplicity of products, many sources for product manufacturing, and growth that is moderate and relatively stable. Europe and the Middle East are contrasting regions with respect to the maturity of their composites markets. In Europe, the composites industry today is mature. The European composite industry amounts to 14.5 billion euros (BEuros) representing 35% of the total worldwide market (41.5 BEuros) with significant composites manufacturing in several countries and numerous companies. Europe's composite market growth is stable with 2 to 3% per year, more or less the same as the GDP annual growth. The total worldwide market is currently divided between North America (40% of total market value), Europe (35%), Asia (22%) and the Rest of the World (3%), indicating that Europe is now competing with North America for leadership in the composites market.

Further analysis of the composites market is very revealing of what a mature market looks like and gives clues for manufacturers and material and machine suppliers for improving their businesses. The breakdowns of the various components of manufacturing (raw materials, intermediates, equipment distribution, and processing) are given in Figure 1 for the entire world composites industry.

Comparisons of the various components of product manufacturing (from Figure 1) with the total share reveals much about the nature of the composites business in each of the regions. For instance, raw material costs of 38% are less than the total market share for North America (40%) while the processing costs (41%) are slightly higher. These data are expected since most of the raw materials are supplied locally in North America (hence a slightly lower price) but labor and other processing costs tend to be higher. In Europe, the raw material cost is also slightly lower than total market and the labor is also slightly higher. Hence, the cost profile of composite manufacturing is strikingly similar in Europe and North America, again confirming their similarities as mature markets.

Note, however, that in Asia Pacific the cost of raw materials is higher (24%) and the cost of labor (20%) is lower than the overall market share (22%). That profile is also as you would expect since this region is known as a low-cost labor market and, furthermore, many raw materials are imported into the region and are, therefore, higher priced. The biggest deviation from total market share in the entire chart is in Asia Pacific equipment where the percentage of equipment cost is much higher (30%) than the total market share (22%) indicating that machine costs are very high in that region. The profile for the Rest of the World does not differ much

from the overall market share but that may be a reflection of the small size of the market and the uncertainty of data in this region.

Note also, at the bottom of Figure 1, that the greatest component for adding value is in processing (18.8 BEuros) followed by raw materials (7.0BEuros) out of a total value added of 33 BEuros. This data suggests that component manufacturing is the single most important component in adding value to the products, as is normally expected in a relatively high technology product area. Certainly the component part manufacturers have a critical importance in the composites industry.

The composite market for the Middle East is clearly different from that of North America and Europe. The share of the market for the Middle East cannot been accurately determined but is obviously small (it is part of the "Rest of the World" at 3%). Only a few Middle East countries have significant composite manufacturing firms and those have a limited capability.

These contrasting scenarios, Europe versus the Middle East, present interesting comparisons and, for those companies that are globally oriented, both Europe and the Middle East offer different but inviting opportunities. In Europe, the size and stability invite entry for those companies that have low-cost manufacturing and/or high performance or quality products. The market can be approached much like the market in North America. In the Middle East, the patterns that have proven to be profitable for North American and European companies are either joint ventures or licenses of technology. The joint venture has the potential for higher profits but also has greater risk. Licensing is a good method to gain some additional profits with very little risk. Let's look at both regions, Europe and the Middle East, in detail to see what is happening and where your company might fit.

Europe: Contrast by countries

Three countries account for about 60% of the European market : Germany with a market share of 27%, Italy with 17% and France with 16%. The dominance of these three countries is explained either by the important size of some markets such as aeronautical and automotive, or by the importance of specific sectors such as windmill energy in Germany or boatbuilding in France.

Much growth of the European market is due to the emergence of Eastern Europe. The European Union welcomed ten new countries in 2004 and the arrival of the Eastern European countries introduces new dynamics with opening of new plants and domestic growth much higher than in the more stable markets of Western European countries, in particular France and Germany, which are currently falling in overall growth rate. Spain is also worthy of note for the strong growth of its construction sector along with the quick development of its wind-energy sector.

Europe: Contrast by markets

The composite growth in Europe is equally driven by growth in application industries, in which composites are the traditional major material, and by growth through penetration in markets where other materials have been traditional. The first type is illustrated by the strong overall growth of traditional composites markets like shipbuilding (7%) and windmills (18%). On the other part, composites have an important penetration in some sectors such as aerospace (9%), automotive (7%) and sport and leisure (5%). In the aerospace industry, the high composites

production growth of about 9% per year is due to the compounding effects of penetration (5% per year) and the overall expansion of the aerospace industry itself (4% per year). The penetrations of composites into both commercial and military aircraft are shown in Figure 2.

The **aeronautical sector** is looking good. New aeronautical programs such as A380 and A400M, Falcon, Tiger, NH90 are utilising composite materials more than the old ones. While in 1985, planes like A310, A320, A300-600 contained around 13% of composite materials, current planes like A380 use 23%. And the same trend is going on both civil and military aircraft. Projections indicate that overall composite use will be 35% by 2008.

The **wind-energy industry** still shows potential (+18%), but it must be said that the tremendous growth rate of this sector has been slowing down for the last eighteen months because most relevant sites are now equipped. Also, technical problems of offshore windmill farms have not totally been solved yet. And finally, there is increasing protest from certain environmentalist elements about wind energy farms. Nevertheless, many projects are under consideration, especially in the southern countries including France.

The **transportation industry** continues steady growth. Reinforced thermoplastics, in particular, performed very well in the car industry in Europe in 2004. Their regular growth shows an uprising interest of the automotive industry for this material. Concerning thermosets, the automotive industry uses more and more natural fibers such as hemp and flax, or wood fibers. Railway and mass-transit continues as a steady market. The use of compressed natural gas tanks is growing, but is still small.

The **leisure boat industry** is booming, especially in France, Gemany and Italy. As mass production techniques are more widely used, prices are decreasing and sales are boosted.

Industrial applications continue growth following an especially good 2003 year. The industry maintained good performance in production of tanks and pipes for large scale chemical and power plants. There was a good increase in filament wound pipes. Another outlet was rehabilitation of public networks. Public authorities started to renovate sewage systems neglected for many years.

Europe: Difficult year for a few segments

Though **construction** is recovering in Europe, we do not see bigger penetration of composites materials in building and civil engineering. Unlike the United States, Europe lists few bridges or pedestrian crossings using composites solutions. The electrical industry is stagnating with a big increase in imports from Asian countries.

Europe: Materials

Following a significant decrease of the price of most composites products between 1995 and 2003, the composites industry has been facing continuous increases in the price of raw materials during 2003 and 2004. Europe was specially hit by these increases. While this bodes well for the materials suppliers, a continued increase in prices could reduce the penetration of composites into markets such as automotive and aerospace.

A few material segments are growing rapidly and deserve special notation. For instance, thermoplastics resins producers and thermoplastic intermediate processors are growing about 8% per year while thermoset growth is 3%. Of course the thermoset business is still much larger,

but the rise of thermoplastics suggests a narrowing of the difference in market size. But, you might ask, is this new products or are thermoplastics taking business away from thermosets? The fact that thermoset growth is only 3%, which is lower than the overall market growth rate, suggests that thermoplastics are taking business from thermosets.

Thermoplastic products are preferred because of two main reasons: 1) They are more adapted to automated processes and, 2) They are easier to recycle. As reported in last year's summary of the European market and detailed below, the need for developing recycled products is especially important in Europe because of the stringent laws which have been and are being enacted on recycling of all components of all manufactured products. Today, European countries are more competitive on thermoplastic than on thermoset process. For instance, European tennis racket manufacturers are now thinking about returning a part of their racket production to Europe because of the lower overheads costs, transport costs, and to help with technology protection. The cost details explaining the advantages of thermoplastics are shown in Figure 3.

The carbon fibers segment is growing at 7%. Material producers are increasing their production capacity. In November 2004 Toray/Soficar inaugurated a new carbon line in Abidos (South of France) producing 1,800 tons. Zoltek is now producing precursor material in its Hungarian plant.

Europe: Manufacturing methods

Automated processes like compression molding (SMC, GMT) and resin injection (injection moulding, BMC, RTM) continue to substitute for manual processes with an annual growth of 7% per year in value. From 2002, the RTM process has been expanding through both dynamic companies and under the impulse of the PPE (Pôle de Plasturgie de l'Est) that encouraged the dissemination of this process. We could see the development of RTM and RTM Light for very big parts in trucks, agricultural machines, tanks, etc. in the near future.

Europe: Concentration, mergers and restructuring

Consolidation of the composites industry is going on. After the segment of raw materials and final market companies that started concentrating several years ago, the segment of processors is undergoing active movements (Plytron Gmbh acquired by Gurit Sw., Bekaert' composite activities acquired by Exel Oyj, Dynamit Nobel/MG Technologies/Menzolit-Fibron, Kerstner acquired by Lamberet, Chem-Trend by Freudenberg etc.).

Europe: Environment and regulations

Recycling is one of the key issues of the composite industry. A major challenge that faces the FRP industry over the coming years is how to deal with production and end-of-life waste. New European waste directives on landfill and incineration put a lot of pressure on the traditional disposal routes. Landfill disposal of composite waste is now forbidden by most EU member states, and incineration will have limits imposed on the level of energy content. Also the directive 2000/53/EC, i.e., "to ensure that operators set up systems for the collection, treatment and recovery of end-of-life vehicles" will greatly impact the automotive industry.

In order to meet these challenges, key European suppliers together with the European composite trade association, EuCIA (European Composites Industry Association, formerly GPRMC) first introduced a 'European Composite Recycling Concept' and the "Green label" and mid-year 2004 created a company called ECRC. ECRC will serve as a common center for joint ideas and efforts, providing consultancy, expertise and solutions on technical subjects as well as guidelines on the latest European waste directives. In return for their financial support, participating companies will be entitled to display the green FRP recycling label on their products.

Europe: Patents and innovation

The number of new patents is also interesting to study and is presented in Figure 4. Considering the worldwide composites market, the number of new patents on composites manufacturing processes has decreased by 3.4% since 1992. The greatest growth in composites patents is occurring in Asia. But it is important to point out that among developed countries, Germany is the exception with an increase of 2.1% in the number of new patents.

During the JEC Composites Show 2004 where Germany was well represented, many of these new developments were on display. In addition to the exhibition hall with 890 exhibiting companies, outstanding projects were presented during end-user forums and technical conferences. The significant increase (+10%) in the number of visitors (22.591) and journalists (126) expressed the dynamics of the industry. The key-word was innovation from raw materials to manufacturing processes to new applications. Let us list a few innovation awards such as the European project Hycoprod focused on the development of cost-effective manufacturing methods for large monocoque railway sandwich structures, a spoiler center fitting for the Airbus A340 by Cytec and Fisher Austria, , large thrust pads for hydrodynamic bearings by Alstom, pultruded roofing structure by PRAS Italy and DCP France, the Silvretta PURE ski binding fixations by Advanced Polymer Engineering Gmbh. Also in September 2004, Michelin unwrapped the airless composite tire that could well revolutionize our driving experience.

Middle East: What is happening

In spite of the political problems in some countries in the Middle East, many countries in the region are safe and business is thriving. In fact, not only are the composite markets in the actual Middle East region growing, but the manufacturers of this region are exporting widely, especially to other Islamic areas such as North Africa and Central Asia. The Middle East could be poised for rapid growth with the need to rebuild the infrastructure in Israel/Palestine and Iraq as well as the general relief and infusion of capital that would accompany reduced tensions.

The major market segment for composites in the Middle East is industrial products, especially pipe and fittings for both water and chemical/oil applications. The high price of oil has led to booming economies in some of the countries, such as the United Arab Emirates (UAE), leading to investment capital that has been put into high quality manufacturing equipment and engineering services for composite manufacturing ventures. These new companies have successfully competed throughout the Islamic world. For instance, one UAE company has recently signed a contract to supply well casings to Libya for the vast water redistribution project that is underway in that country. (A major reservoir of underground water was found in the Libran desert and that water is to be distributed throughout the country.) The

technology for this project is licensed from a U.S. company. Other similar licensing arrangements have been made for chemical product piping and low pressure oil piping. It is anticipated that high pressure oil piping will soon be arranged and also licenses for light and utility pole products. Surely the concept of licensing is working well.

Some of the manufacturing companies in the Middle East are joint ventures with U.S. or European companies. In those cases, the technology is transferred with the joint venture so licenses are not generally required. These companies compete well in the Middle East markets and generally benefit in market reputation from their ties to U.S. and European partners.

High tech markets, such as aerospace, are more difficult to penetrate by the Middle East manufacturers. However, either by joint venture or by licensing, even these difficult-to-enter markets should be opened because of the advantages of physical proximity for transportation cost reduction and responsive servicing.

Summary

Composite manufacturing is going well in both Europe and the Middle East, although it is very different. One is mature and has great immediate possibilities for profits, provided that the products being introduced meet the highest quality and technology standards. For those who have technologies that address the particular problems of Europe, such as recycling, the profits in Europe could be rapid and large.

For the Middle East, the word is potential. Those companies who are willing to build relationships (either through joint ventures or licensing) are likely to reap high profits, but they must be patient.

It will be interesting to reassess both of these markets next year.

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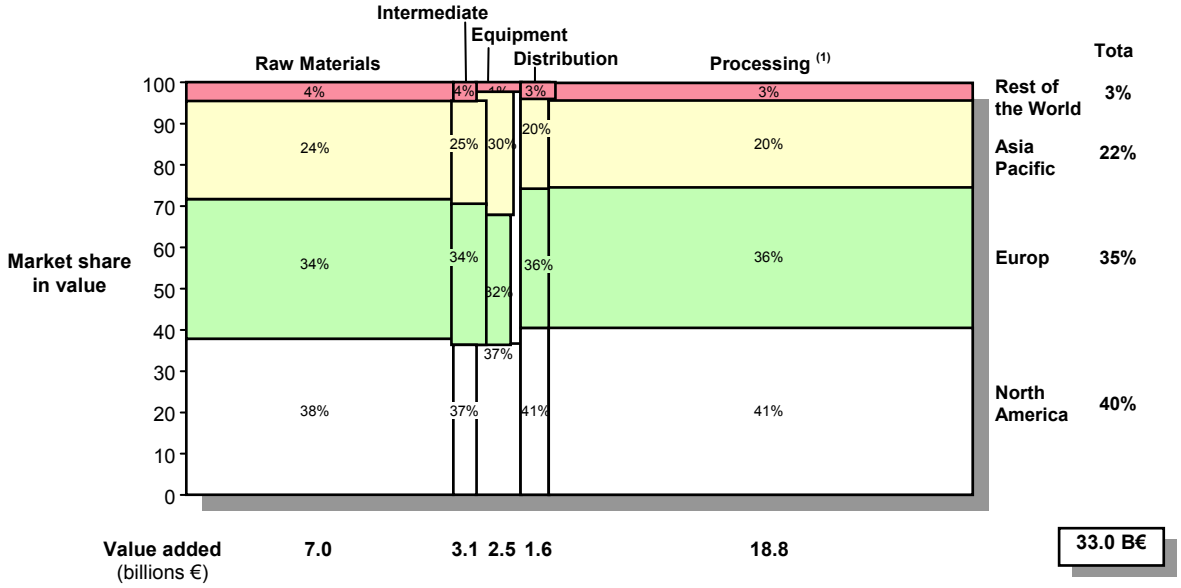
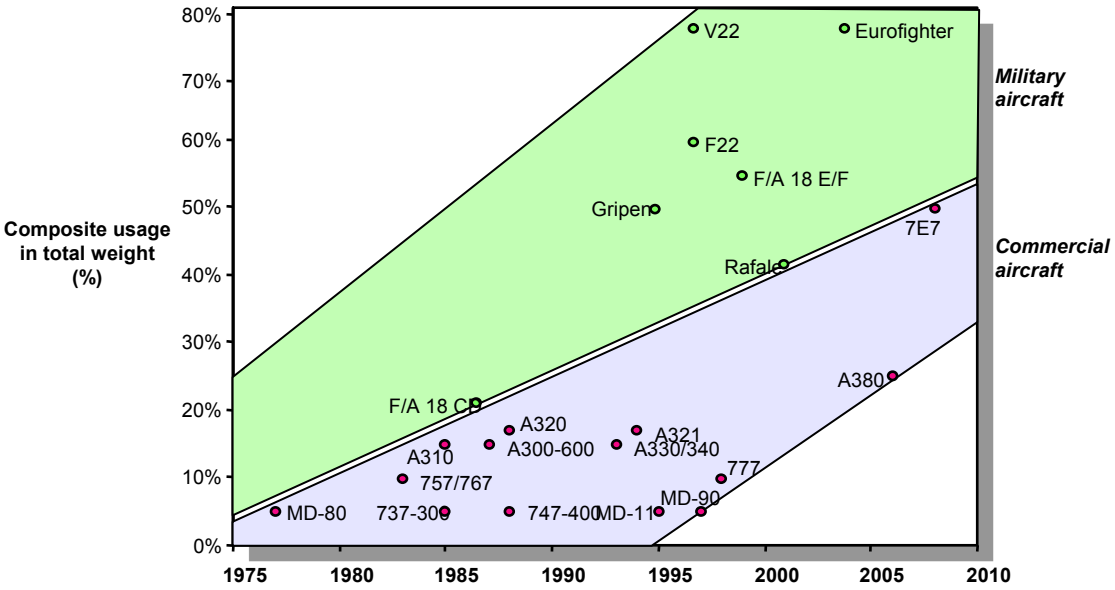
Figure 1. North America and Europe account for 75% of composite market value



Note : (1) including integrated processors like EADS in aerospace or Salomon in skis

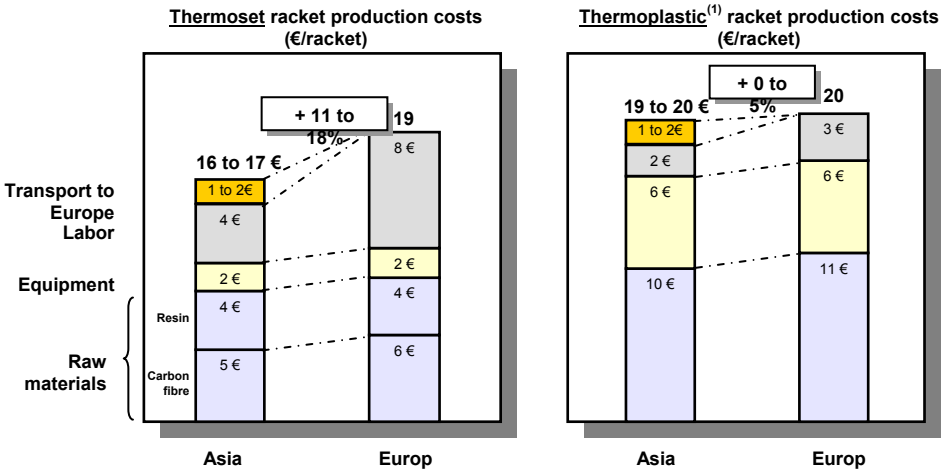
Figure 2. Composites (1) utilization in aircraft has grown strongly for the past 30 years



- **Current planes contain 13% of composite materials. Projected to contain around 35% by the year 2008**

(1) Glare excluded (glare accounts for about 2% of material use in total weight of a commercial aircraft)

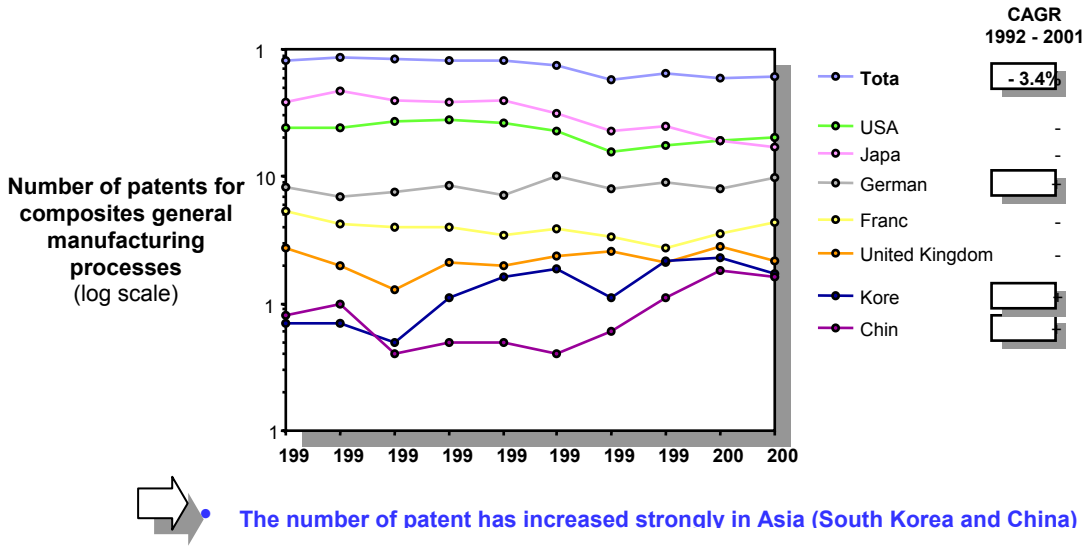
Figure 3. Occidental countries are more competitive on thermoplastic than on thermoset process



- **European tennis racket manufacturers think about relocating a part of their tennis racket production in Europe (lower SG&A and transport costs, technology protectionism)**

(1) Thermoplastic rackets have better absorption properties than thermoset ones

Figure 4. The number of new patents for composites manufacturing processes has decreased by 3.4% worldwide since 1992



Note : Complete number of patents for 2002 and 2003 are not available because of a delay of 18 month between deposit and registration