


WORLD MARKETS FOR FRP: EUROPE, ASIA, AND LATIN AMERICA

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Overview

Why do we care what the markets are around the world? Generally because we can get ideas for developing our own domestic markets and because we might see opportunities for expansion into some overseas markets where our products have a good fit. This article will discuss the advances in non-US markets and will also discuss the potential that exists for FRP in these markets. In some of the areas the FRP technology and businesses are much like those in the United States. In other regions the FRP markets are just now blossoming. FRP is being used in ever more applications, some unique to FRP and some replacing older materials that are either in short supply or are inferior in performance. Whatever the situation at present, the trend in adopting FRP throughout the world is clearly the same everywhere  growth and improved technology.

Europe

Comparing the composites markets in Europe and the United States is interesting and a bit amusing, especially when we ask "Who is leading in composites?" The majority of Europeans say that the US is ahead, and they cite examples like the stealth bomber, space craft, and general volume of FRP products in the marketplace. On the other hand, the majority of Americans say that Europe is ahead and cite the greater acceptance of FRP in infrastructure

applications (such as the advanced composites highway bridge in Oxfordshire, UK), the widespread use of composites in energy generation, and the large composite sections now employed in some commercial jet liners. As Gordon Bishop of NetComposites, a European-based but worldwide composites newsletter reports, "People see (and remember) the high-profile press stuff from across the Atlantic [both ways], without doing a structured comparison of the whole industry." Gordon goes on to say that, "In reality I think that the only major area in which Europe has a lead is in thermoplastics. We [Europeans] have different legislation (and mentality) when it comes to environmental issues and this has driven the development of cost-effective materials and processing solutions for thermoplastics in Europe. Even in the last year I have sensed a strong shift in attitude in the US though, so I think that this situation will change over the next five years."

Gordon is clearly correct in his assessment that Europe has a large lead in the use of thermoplastic composites, especially glass mat thermoplastics (GMT) versus SMC, long-fiber reinforced thermoplastics and high performance thermoplastic composites. A major focus in Europe is to build thermoplastic parts that have the capacity to be "re-used" or recycled. The acceptance of thermoplastics in the automobile market, in particular, has led to a growth of thermoplastics that is about twice the growth of thermosets in Europe. The ability of the thermoplastics to be re-melted and then reused in some application of comparable performance and value is certainly different from the recycling of thermosets where the secondary use is usually as a filler. Few US materials suppliers and molders are pushing the use of thermoplastics composites and when they do, the materials and technology generally come from Europe.

The area of wind turbine systems is enormous in Europe and growing at an accelerated rate. Just as the Europeans are more concerned about recycling than are Americans, so too are the Europeans more concerned about environmentally friendly and economic energy sources. Wind energy has proven to be a tremendous new market for FRP materials. The newest wind turbine blades are in excess of 180 feet long! To structurally permit these very long blade lengths, carbon fiber is playing a key roll as the main material of choice. Using novel new production methods, these very long wind turbine blades will soon be generating an ever increasing amount of energy for Europe. But, blades are not the only component of the wind turbines made from composites. The shroud that covers the gear mechanism is often made of fiberglass reinforced polyester. Some companies have also used FRP for components of the tower that supports the entire wind turbine structure. This is a big market and will continue to get bigger as the demands for energy increase in the growing European Union.

Just as in the US, and perhaps with even more emphasis because of the pollution problems, European manufacturers are moving from open molding to RTM and related resin infusion methods. This trend can be seen in Figure 1. Another impetus for the use of resin infusion methods is higher performance reported by some of the manufacturers. Similar European trends towards cleaner, less-polluting and higher sophistication in manufacturing methods can be seen in the growth of filament winding, pultrusion, and injection molding of composites, as illustrated in Figure 2.

The markets in Europe are similar to the markets in the United States. With the establishment of the European Union, and with many more nations in Europe eager to join, the European trade region will soon be at least as large as the US. Moreover, the general lack of

many raw materials in Europe leads to a need for synthetic materials such as FRP. Therefore, the impetus for FRP growth in Europe is quite strong and, when the second tier of nations join the European Union, the market may be larger than the US.

Asia

Asia is all about potential and India has the most FRP potential growth of any country in the world right now. With less than 5% of the Asian FRP market, there is plenty of room for growth in India, perhaps as much as 30% per year for many years to come. India has a large population base (over one billion people) eager to work at very competitive wages. India's very small percentage market share of the Asian FRP market compares to its neighbor, China, with over 20% of the Asian market in FRP. Remember, too, that demographic predictions say that India will be the world's most populous country by the year 2020.

A review of India's FRP market shows that there are many small factories doing hand lay-up but also some large and forward-thinking companies purchasing the most advanced, up-to-date computer controlled composite processing equipment such as filament winding machines, pultrusion machines, RTM and other equipment.

One focus that is quite novel to India, due to the large supply of raw materials, is the use of bamboo in the FRP industry. Many composite parts, including all the shower units, corrugated roofing, pipes, and storage tanks within full size housing projects are being built using bamboo as the reinforcement.

The construction market is also being actively pursued in India by many fiberglass companies, some of them from the United States. Owens Corning has a fully operational fiber producing facility in India. Traditional materials, such as wood, are in short supply in India and

that is why components made of FRP, especially bamboo and fiberglass, are a natural proposition for building and construction applications. Major research programs are also underway investigating the use of other natural fibers, such as sisal and hemp, in composites.

The rising affluence of the Indian people is also a potential market to be tapped. Leisure activities are becoming more important. A growing middle class, although quite small now, has tremendous opportunity growth due to the sheer numbers of people it represents. Hence, the Indian automobile industry is a huge potential product market. There are a number of Indian companies making automobiles and trucks as well as motorcycles.

The current transportation market, is currently dominated by both motorcycles and by motorized vehicles that consist of locally-made bodies attached to small motors (some about the size of lawnmower motors). There will be a growing market for hoods, cabs, frames, and cargo containers that can be used as part of these locally-built vehicles. Composites are a logical choice for these components.

In spite of all the potential of India, the chaotic rules, regulations and infrastructure in most Indian cities is a detriment to growth. Establishing an effective infrastructure (roads, utilities, water, etc.) will be the key to India's growth. An article in the November 2002 *National Geographic Magazine* reports that in at least one major Indian city, Hyderabad, the infrastructure problems are being solved and the city is poised for explosive economic growth. Perhaps that city will be a model for all of India and the potential will be fulfilled.

The China market is still dominated by the FRP industries in the southeast provinces of China that border Hong Kong (such as the province of Guang Dong) and Shanghai. In these areas infrastructure development is going along well and the FRP market is enjoying the

benefits. Other parts of China are still very primitive and locked into 1970's governmental policies and controls. Communist authorities still have much influence over all aspects of economic development in these far-flung areas. Even in the developing areas of Shanghai and southeast China it is not unusual for each factory to have a Communist official on the payroll just to give "consultation" and "direction" to the managers. In truth, the official is often a highly paid roadblock.

China hopes to start production of its own 120-seat aircraft in the next two to three years. This plan is reminiscent of the Indian plan, reported in last year's *Composite Fabricator* article on World Markets, where India would build its own jet fighter. The Chinese airplane, to be built in Shanghai, will use some technology learned under subcontract to Boeing for the horizontal stabilizers for the B737, the cargo doors for the B757, and several parts for various Airbus planes made currently by several Chinese aircraft companies. Some other aircraft companies, from North America, Europe and Latin America are in active negotiations with the Chinese to build airplanes on a license basis.

Other countries in Southeast Asia such as Malaysia, Indonesia and Thailand are also growing rapidly, although not as quickly as China nor with as much potential as India. The government in Bangkok, Thailand has recently made a concerted plan to change all the city buses from gas/diesel engines to compressed natural gas (CNG). This will include hundreds of buses that must be converted. Most, if not all of these CNG tanks are metal/composite or composite/composite styles.

In Northeast Asia, South Korea and Japan are emerging from their recessions, especially South Korea. The FRP market in these countries will continue to grow, albeit quite slowly both

because of the residual economic problems and the slower growth of these economies when compared with the rest of Asia.

The Middle East is, of course, a mixed bag of situations. Israel and Palestine are not appropriate markets nor will they be for some time to come. However, other parts of the Middle East continue on a reasonable growth path, especially in areas such as pipes and fittings. The use of FRP in place of steel, iron and concrete in pipes is not only accepted but, in most cases, is preferred. That has resulted in several very large water distribution and waste systems being specified as FRP, largely with US specifications although with some local manufacturing. As the populations of the Middle East countries continue to grow, this gradual increase in FRP usage will continue.

Latin America

Growth in South America is still slow due to the serious recession in Argentina that has a major impact on the other countries in the region. Brazil has some growth in the FRP field, but is hampered by its southern neighbor, Argentina. The FRP growth in Brazil is largely a reflection of the tremendous growth in urban population as millions flock into the major cities, especially Sao Paulo. One company in Brazil we are familiar with has over 20 high tech spray-up systems making bathtubs, sinks, counters and wall panels that have a granite look. These spray-up machines are being operated 24 hours a day, six and seven days a week.

Due to the vast size of Brazil, air transportation is a critical link in the infrastructure of Brazil. Embraer ✎ Empresa Brasileira de Aeronautica SA ✎ is Brazil's largest aircraft manufacturer. Embraer's headquarters is located in the State of Sao Paulo. Embraer is a group with widely diverse interests in the aerospace field. The groups's activities entail the design,

development, production and marketing of a range of turboprop and jet aircraft for regional airline and military use as well as turboprop aircraft for general aviation, corporate and agricultural utilization. While the use of composites in Embraer aircraft is still quite small, the growth of the company will logically force additional use of composites as it competes with other manufacturers worldwide.

The movement of people to zones where manufacturing is booming and jobs are being created fuels Mexico's growth as well. Mexico City continues to lead the Mexican FRP industry, where the economic strength of the country is controlled and continues to dominate the rest of the country. Tijuana and the Texas border have seen larger growths of companies than in the past and many are FRP companies with US ties.

NAFTA still plays a key roll in Mexico. US companies have already established manufacturing plants in Mexico, especially to take advantage of the incentives to locate in smaller cities and to benefit from the low labor rates.

Over the past few years, the severe housing shortage that plagues Mexico has seen a dramatic increase. While population growth has slowed, the demand for housing has increased because a large segment of the Mexican population is of the prime age for setting up new households. In addition to a shortage of existing houses, many of the existing units are in dire need of repair. This shortage provides an excellent opportunity for US exporters of building products.

The potential of manufacturing composites in the rest of Latin America is strongly dependent on the political and financial stability of the country being considered. There are undoubtedly opportunities and those who take the risks are in-line for the profits (or the losses).

Figure 1 Matrix Materials Used by UK Composites Companies (%)

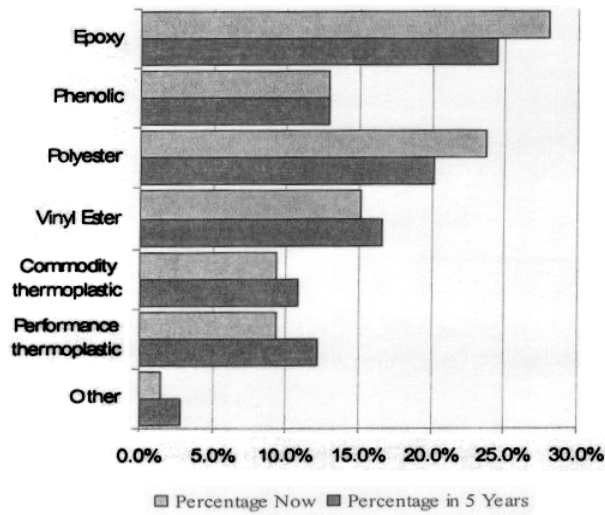
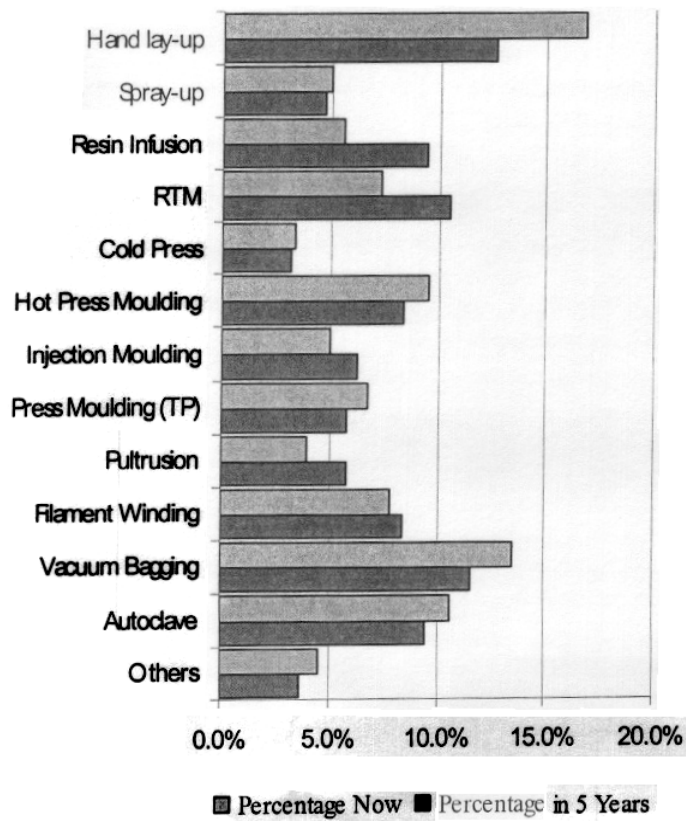


Figure 2 Manufacturing Processes Used by UK Composites Companies (%)



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