

Composites for Developing Countries

Once considered a pejorative moniker, the term “developing country” now represents promising business opportunities. In an era of global supply chains, reduced trade barriers and increased access to information, it is instructive to look at applications of composite materials in countries striving to achieve our standard of living. Indeed, countries with little existing infrastructure maybe ideal candidates for lightweight, energy-efficient composite structures with long life expectancies. Material suppliers and fabricators are both exporting and setting up shop in developing countries to meet the demand in the emerging energy, transportation, marine and water handling markets.

China

China is increasingly becoming a market-based society as they endeavor to raise the standard of living for their vast population, especially in rural areas. At the same time, urban centers are magnets for outsourced manufacturing for overseas partners as unlikely as their WW II nemesis, Japan. During China’s President Hu Jintao’s recent visit to the United States he spent more time meeting with Microsoft’s Bill Gates and touring Boeing’s aircraft facility in the wake of a recently signed deal for Beijing to purchase \$4.6 billion worth of aircraft than he did in the nation’s capital meeting with politicians (not to be outdone, Airbus is considering building commercial aircraft in China). It may be President Jintao’s training as a hydrology engineer that is accelerating large-scale infrastructure projects in the country, such as the \$24 billion Three Gorges Dam across the Yangtze River.

E-Composites, Inc. has issued a recent report based on a survey of over 100 Chinese material suppliers and fabricators (www.e-composites.com/MarketChina.htm) that estimates growth to over 5 billion pounds by 2011, surpassing the U.S. by 2013. In a summary, E-Composites states: “The rapid growth in Chinese composites market is spurred by growth in pipe, tank, grating, pultrusion, construction, wind energy, automotive, electrical, and electronics market. In the last five years, average growth in Chinese composites market was in double digits. [The] world’s multi-national companies have invested aggressively during the last several years to establish itself in China as the world’s most populous nation liberalizes its economy and enjoys rapid growth.”

One example of this investment comes from DIAB (Laholm, Sweden), who is opening a new facility in Kunshan, China (31 miles west of Shanghai). Anders Paulsson, CEO of DIAB, commented: “In recent years a number of our major European customers have established manufacturing facilities in Asia. As a worldwide supplier, it is important that we are able to support our global customers on a local basis.” Specifically, DIAB sees accelerated growth in the marine, surface transportation and wind energy arenas.

China wants to increase renewable energy sources by the year 2020 from 7% to 15% and wind power will play an integral role. Wind power equipment must have over 70% local content and this has major players scrambling to establish a foothold in the country. LM Glasfiber has recently concluded a long-term supply agreement with the Chinese joint venture Acciona Windpower. The agreement is for an aggregate of 560 MW. GE wind

turbines built in Germany have been selected for two new wind farms in Hebei and Xinjiang provinces of China. The two projects will add a total of 75 MW of wind power capacity to China's electricity grid. China holds the largest wind resource of any country in the world with a potential wind power capacity of 250 gigawatts onshore and 750 gigawatts offshore. And, don't expect to hear complaints from homeowners about view obscuration, noise pollution or bird kills in China.

Distribution of energy across China's vast country is also a growth industry that Composite Technology Corporation (CTC) plans to capitalize on. They manufacture high voltage transmission cables that utilize a composite core instead of steel. Their proprietary Aluminum Composite Core Conductor increases energy capacity; reduces cable sag; eliminates bi-metallic corrosion issues and increases pole span distance. An initial order is valued at just over \$1 million for 60 kilometers of cable but CTC expects rapid growth now that they have mastered the challenges associated with exporting to China and working with local authorities.

As if these examples of opportunities in China do not provide enough of a wake-up call, consider the surge of raw materials being produced there for export. I don't think a week goes by where I don't receive an E-mail offering E-glass in various architectures. I'm almost afraid to ask for pricing information.

India

India is the other "sleeping giant" marketplace with a population that is expected to exceed that of China in the near future. Like China, India has a majority rural population that is not benefiting from global trade as are their urban technology centers. Although India's government is not as aggressive as China's with regard to pursuing economic objectives, they do have an English speaking population and honor intellectual property rights better than their neighbor to the East.

Joseph Vackayil of www.financialexpress.com quotes NG Nair, former head of Composites Technology Centre, IIT-Madras: "India has already constructed a substantial technological base for the FRP industry. We have trained manpower and technical capability to make process machinery and harness the technology." India is using composite materials in a myriad array of applications, including aerospace, road and train transport, housing, pipes, construction of bridges and water purification plants, sewage disposal, chemical plants, electrical installations, wind turbine blades, marine vessels, automobiles and in building applications. However, Mr. Nair notes that output of composite structures is still only 15% of China and 5% of the U.S. There's a lot of upside potential here.

Owens Corning is one company poised to take advantage of this emerging market. They recently added a second fiberglass knitting line at their Taloja, Mumbai plant to support multi-axial glass production. Satish Kulkarni, Managing Director for Owens Corning India Ltd. notes that "These highly technical fabrics are used in several key industries but especially for the wind energy market to supply growing demand in India and surrounding regions for continued growth of renewable energy sources such as wind

power.” Owens Corning’s interest in India goes beyond wind energy. Owens Corning Composites Business President Chuck Dana summarizes the potential for composites in developing countries when he says “Increasingly, composites solutions are helping transform the lives of people, in India and around the world, by offering environmentally-friendly cost-effective solutions to some of the basic necessities such as providing clean drinking water and electricity.”

Owens Corning is not without competition in India. The Saertex Group has opened a new plant in India to manufacture multiaxial interlaid scrim made of high-tech fibers in Pune, 150 kilometers southeast of Bombay. The India facility is mainly intended to serve the Asian wind power, automobile and shipbuilding industries. Saertex is well situated to serve the wind turbine blade market, as Suzlon Energy, the country’s largest wind energy company is also based in Pune. Suzlon also has their share of competition with Vestas RRB India, Ltd. investing heavily in their Chennai facility to ramp up production. Installed wind power capacity in India grew 45% last year and is currently estimated to be 5200 MW.

Just as high technology outsourcing has skyrocketed in Bangalore in part due to the efforts of a significant Indian-American engineering pool, the US should be well suited for creating partnerships in the composites industry. Australian company Quickstep Holdings Ltd. recently partnered with material supplier Avanti Corporation of Japan and Indian-based manufacturer NTF to serve the mass transit, automobile, medical equipment and wind energy markets. This innovative business strategy lets Quickstep get their foot in the door by leveraging indigenous manufacturing capability.

Africa

The African continent is much like China and India in that there are some isolated high technology regions surrounded by an overwhelmingly impoverished rural landscape. South Africa has a long history of composite boat building, a logical outgrowth of their Dutch and British heritage. With the end of the Apartheid Era, South African companies have looked north to serve the continent’s industrial markets.

Collins Fibreglass Plastics was established in 1958, and is perhaps the country’s oldest fiberglass manufacturer in South Africa. The company created the Colliquip Filtration System, which director Peter Eliot describes as a non-corrosive, flexible filter-tank solution suitable for a variety of applications. Mr. Eliot says its filtration business has shifted from consumer to industrial over the past few years as they begin to penetrate water purification markets in the rest of Africa.

Unfortunately, for the outsider, Africa is one of the most difficult places in the world to do business as a result of instable governments and unbridled corruption. This is not to say that the need for water and oil industry infrastructure systems is not profound. Right now, this landscape is best left to the individual entrepreneur where altruism outweighs the corporate bottom line.

Middle East

Although it would be a stretch to call the wealthy kingdoms of the Middle East “developing countries,” there are a number of leading edge infrastructure and building projects that involve composite materials popping up in the desert. Countries such as the United Arab Emirates are looking beyond a petro-dollar economy and are investing in tourism-related projects. The Mall of the Emirates Snow Centre in Dubai is a 25-story stadium sized building where visitors can snow ski in the middle of the desert. The roof panels are foam-cored FRP to help maintain large indoor and outdoor temperature differences and resist high wind loads. Dubai is also planning the world’s tallest building at 160 stories for completion in 2009. Arabian Profile of UAE manufactured the Snow Centre roof panels and supplied 85,000 m² of cladding for the Aspire Sports Hall project for this year’s Asian Games in Doha. There are excellent opportunities to provide engineering support on some of these exciting projects.

As one could imagine, the need for FRP pipe is outstanding in the Middle East. The Saudi Arabian Amiantit Company is at the center of this business and recently announced orders totaling \$25.4 million to supply pipes and accessories for projects in Saudi Arabia and Abu Dhabi, UAE. “Supplying pipe systems for Saudi Arabia's petrochemical, industrial and water & sewage requirements continues to be at the core of our manufacturing activities,” said Eng. Fareed Al-Khalawi, Amiantit President & CEO. Also, Amiantit Group subsidiary manufacturing companies Amitech Argentina and Amitech Brazil are supplying pipe systems for multi-million dollar water infrastructure projects and irrigation networks in their respective countries. In neighboring Qatar, Future Pipe Industries Qatar has recently been selected to supply the Common Cooling Water Project in Ras Laffan for Qatar Petroleum \$172 million of fiberglass pipes and fittings.

Natural Fibers

Increased use of natural fiber composites may find developing countries supplying raw materials. Fibers such as hemp, jute, flax and kenaf can serve as alternatives to E-glass in less demanding applications. According to Prof. Lawrence Drzal, director of the Composite Materials and Structures Center at Michigan State University, “Bast fibers, such as flax, hemp, jute and kenaf, are noted for being fairly stiff when used as a composite reinforcement. Leaf fibers, including sisal, henequen, pineapple and banana, are noted for improving composite toughness with somewhat lower structural contribution. Finally, seed or fruit fibers — cotton, kapok and coir (from coconut husks) demonstrate elastomeric type toughness, but are not structural,” reported by Dale Brosius in www.compositesworld.com. Mr. Brosius notes that textile flax is grown widely in China and Russia; 90% of the world’s jute comes from India and Bangladesh; and 75% of kenaf production is from India and China. Natural fiber processing in developing countries is a labor-intensive manual process appropriate for the economies in those regions.

Conclusion

The American composites manufacturing industry does a stellar job of identifying opportunities where composite materials can improve domestic recreational and

industrial products. However, as trade barriers worldwide break down and supply chains open up, it makes very good business sense to be aware of opportunities around the world. Companies not based in the U.S. typically don't have large domestic markets and are geared to doing business with other countries, which means we have to play catch-up in international trade arenas. Those who figure out the logistics of foreign trade can transform their domestic niche market to serve the recent surge in global demand.



Figure 1. Large Infrastructure Projects, Such as the Three Gorges Dam in Du Huaju, China May Provide New Opportunities for Composites [New China News Agency]



Figure 2. A composite Core is used for an Aluminum Conductor Power Transmission Line [CTC]



Figure 3. The Author Assisted in the Engineering of Composite Roof Panels for the Snow Centre in the United Arab Emirates [Getty Images]