2007 State of the Recycled Plastic Lumber Industry
Presented by Brian Larsen

The established goals of the Plastic Lumber Trade Association (PLTA) are to establish standardized testing procedures, promote standards of quality within the industry and promote the use of recycled plastics. The PLTA also strives to facilitate cooperative projects that contribute to a firm, equitable and business-like basis that is consistent with the best interests of the plastic industry and cooperatively work with groups and government agencies on matters of material interest. The organization aims to increase public awareness and promote the acceptance and use of plastic lumber products for consumer, commercial and government use as well as act and function as a clearing house of information for the industry by collecting statistics and information that will aid the growth of the plastic lumber and other associated industries. Over the years, the industry has entered into a more mature business cycle of greater growth and market acceptance. To demonstrate the accomplishments of the industry over the past years, we will review the American Society of Testing Methods (ASTM) accomplishments, look at the success of development projects that explore the structural use of plastic lumber, survey the competing technologies, analyze the current and developing markets, view the stages of business cycle development, glimpse at the trends in raw materials supply and offer a few thoughts for the future of the PLTA.

American Society of Testing and Materials (ASTM) Test Method Development
A number of ASTM standards that pertain to quality and testing of plastic lumber that were modified or in ballot were completed during the last four-to-six-year review process. These include D6662-07, D6112-97(2005), D6117-97(2005), D6341-98(2005). Copies of these revised standards can be purchased from ASTM. .

The following standards represent the significant amount of work and effort of many members of the ASTM D20.20.01 Plastic Lumber Committee. For this we offer our sincerest thanks to the individuals involved.

- D6108-03, Standard Test Method for Compressive Properties of Plastic Lumber
- D6109-05, Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products
- D6111-03, Standard Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement
- D6112-97 (2005), Standard Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes
- D6117-97 (2005), Standard Test Methods for Mechanical Fasteners in Plastic Lumber
- D6341-98 (2005), Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30F and 140F (34.4C and 60C)
- D6435-99, Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes (Withdrawn 2007)

- D6662-07, Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards
- E84-07a Standard Test Method for Surface Burning Characteristics of Materials (Flame spread and smoke developed test)
- E108-07a (Modified), Residential Decking Flammability (Burning Brand Test).

The process for conducting the precision and bias (P&B) review for each of the above ASTM Standards has begun and is being conducted under the direction of Dr. Prabhat Krishnaswamy and Richard Lampo. There is a five-year window of time for this work to be completed after a standard is established. The ASTM committees and testing laboratories are working cooperatively to insure the validity of each standard.

The D20.20.01 subcommittee has had significant ballot activity on Document X-20-43, Standard Specification for Thermoplastic Composite Lumber for Outdoor Structural Applications. The D20.20.04 subcommittee for Marine Waterfront Applications has also had significant ballot activity on Document X-20-51, Standard Specification for Polymeric Piles.

Another ASTM committee focused on evaluating standards for composite lumber is D07.02.07, the subcommittee on wood plastic composites under the jurisdiction of Committee D07 on Wood. This committee, chaired by Dave Gromala and Dr. Bob Tichy, has been busy in moving materials through the building codes. The committee's work has been predominately on wood composites, but there is some overlap and much debate occurring between D07 and D20 committees on the proper test methodology of these material systems.

Two standards have been completed by the ASTM D07.02.07 subcommittee.

- D7031-04, Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products
- D7032-05, Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails).

In addition to this work, a new standard is being developed that establishes the procedure for assigning engineering design values for structural uses.

For products that are not included within the applicable building code, local building officials often rely on a code evaluation report to verify that the product complies with the intent of the code. The primary system within the United States to accomplish this is the International Code Council's Evaluation Service (ICC-ES). The ICC-ES currently has two paths (called "acceptance criteria" or "ACs") for obtaining an evaluation report for decking products – AC109 and AC174. The former includes its own evaluation criteria and references both D20 and D07 test methods. The latter relies primarily on the testing and evaluation procedures defined within D7032. This was accomplished in July 2005 and has resolved much of confusion created by the evolving nature of the ACs. The current version of AC174 was approved February 2007 and AC109 in June 2006.

Technologies

As has been reported in previous *State of the RPL Industry* reports, there are several technologies and polymer resin systems competing within the marketplace. This year's report includes a new section, PVC-wood composite technology.

Plastic lumber has enjoyed significant growth in recent years. In 2007, gains were made particularly in the commercial, marine and recreational applications. A factor worth mentioning which may have contributed to the growth of RPL over the past few years has been the cessation of the production of chromated copper arsenic (CCA) treated wood prompted by the environmental and health threat posed by the leaching of chemicals into soil and water. This development dramatically increased the demand for alternative materials systems in residential applications as well. Despite the fact that new forms of copper-treated wood have been reintroduced onto the market, the demand for plastic lumber as a substitute for treated lumber applications has remained high.

Single Polymer Resin Systems made from recycled HDPE (high density polyethylene) maintained steady market share. At one time the continuous extrusion of structurally-formed HDPE was the clear leader in the all-plastic decking board markets. However, part of the market share enjoyed by single polymer resin systems was lost a few years ago to the greatly expanding bio-composite market. The high price of resin in 2004 and 2005 caused some manufacturers to look for alternative ways to cushion the cost of rising HDPE prices by adding fillers to their product, such as wood and flax. Once HDPE pricing stabilized in 2006, single-polymer resin system makers were able to gain back some of the lost market share when pricing became once again competitive with bio-composites. By the end of 2007, HDPE prices began to soar to near-record 2005 levels. The rising cost of HDPE may once again drive consumers of PL products – both commercial and residential - to revert to traditional wood, or bio-composite products. In addition to the rising costs of feedstock, PE lumber makers have also been hit with a decrease in demand from the residential market, which will affect most of the PL industry sectors that rely heavily on residential demand. One manufacturer reports the demand for decking products was down 70 percent by the year end of 2007.

To combat the downturn in demand and rising material costs, one maker of single-polymer resin systems has diversified operations to include pelletizing plastic and plastic product destruction services for clients.

Extrusion Flow-Molding Systems continue to be developed, adding new technologies and products to the array of plastic lumber available. SPS Inc. (Tilsonburg, Ontario) has created a flow-molding system used by numerous U.S. plastic lumber rail-tie manufacturers. Pushtrushion by Woodshed Technologies (Winona, Minnesota) has emerged as an extrusion technology that is also being used in the production of railroad ties and marine applications. For plastic lumber products used in railway and marine applications, flow molding systems seem to dominate over continuous extrusion manufacturing methods, which are used for products with less demanding applications. However, new applications for continuous extrusion methods are being explored.

Like many other industry sectors, those firms making products with extrusion flow-molding systems often consume HDPE, in addition to other materials, to make composite products. The rising cost of HDPE presents a concern and puts price pressure on finished products. One firm is exploring potential options with different material streams and procuring materials from farther sources outside of the U.S. to control production prices.

Fiberglass Reinforced RPL products and manufacturers have doubled in the last two years, increasing from just two manufacturers to four. While fiberglass-reinforced plastic lumber remains a small share of the plastic lumber industry, the properties of these products allow for diverse applications. In the past, some of the more uniquely engineered projects have been designed utilizing the fiberglass reinforced material systems. Two of the most visible projects have been designed by M.G. McLaren Engineering (West Nyack, New York). This includes the award-winning, load bearing H15 arched bridge constructed in New Baltimore, New York. This project was done in cooperation with Keith Lashway of the New York State Department of Economic Development (Albany).

Fiberglass-reinforced RPL has also shown promise when tested for use in marine applications. Plastic marine pilings have been shown to last for at least 11 years at New York City's Tiffany Street Pier, suggesting they could easily replace the chemically- or creosol-treated woods currently used in marine applications in a cost-effective manner. Researchers at Rutgers University (Piscataway, New Jersey) have secured patents on two fiberglass polymer formulations that increase the stiffness properties of products to mimic that of new softwoods such as pine.

One of the two companies that had been making fiberglass reinforced plastic lumber at the time of the release of the 2005 report has since closed operations. U.S. Plastic Lumber (Chicago), which manufactured the Trimax line, has closed. Trimax is now made by Zeq Manufacturing (Anderson, Indiana). The other company, Bedford (Worthington, Minnesota) continues to manufacture the FiberForce line. Seaward also makes a few lines of fiberglass reinforced products for marine environments (Clearbrook, Virginia).

The PLTA is trying to restructure around the new growth in the fiberglass market and continue to work to get test methodology for standards in place. As mentioned earlier, there is significant ballot activity on X-20-43 for the Standard Specification for Thermoplastic Composite Lumber for Outdoor Structural Applications. Finalizing this standard will help boost increased application of a variety of plastic resin building materials and structural applications.

Polymer/Polymer Systems applications continue to grow. Rutgers University has secured patents for six structural (high stiffness and high stress to creep) polymer system formulations. The Advanced Materials via Immiscible Polymer Processing (AMIPP) lab at the university continues to spearhead the development of PS/PE and related systems which exclusively use recycled plastics. Projects undertaken by the center include the construction of numerous bridges and structures, and new products for the railroad industry. The driving goal behind the work being done at the AMIPP is to create uniquely formed shapes and materials that reduce the amount of plastics needed, while maintaining the structural properties. For example, a one-lane vehicular bridge built by the Rutgers team in South New Jersey was constructed with material utilizing 30,000 pounds of plastic, and required the use of minimal fasteners. In comparison, the two wooden bridges that had been functioning prior to the new bridge being built utilized 60,000 pounds and 90,000 pounds of wood, and many more fasteners. The Rutgers-engineered bridge was lightweight, fast to assemble and cost competitive. Currently

Axion International (Basking Ridge, New Jersey) and Micron Ltd. (London) are licensing this technology.

Demand for the PS/PE blended systems, which can withstand pressures of up to 600 pounds per square inch before displaying signs of creep, is growing in commercial applications. New applications in decking are also being developed for the polymer/polymer system, which will introduce this technology into the residential market. The interlocking I-beam decking system being developed will require fewer raw materials, making the system cost competitive with bio-composite and traditional wood lumber.

The AMIPP lab is doing additional work in the area of multi-purpose flame retardants, which can be used in plastic lumber as well as other applications, and a paint-to-thermoplastic recycling process. Richard L. Lehman is the Director and Dr. Thomas Nosker is the principal investigator. Project updates are on AMIPP's Web site at www.amipp.rutgers.edu.

The PVC plastic lumber industry has undergone major organizational changes in the last few years. Earlier in 2000-2001, the American Architectural Manufacturers Association (AAMA) and the ASTM collaborated to address common industry concerns within the marketplace. In 2004, however, the plastic lumber members transferred from the AAMA to the American Fence Association (AFA), where two subdivisions operate, the Composite Fence, Deck and Railing Manufacturer's Association (CFDRMA), and the Vinyl Fence, Deck and Railing Manufacturer's Association (VFDRMA).

By 2005 the use of PVC in the decking industry had increased dramatically with over 13 varieties of PVC or PVC bio-composite decking products available on the market. Over the past two years, consolidation has occurred and reduced those numbers slightly. To our knowledge, none of these PVC decking and fencing products use any post-consumer or recycled plastic materials.

Like many of the other industry sectors, the PVC industry has been hard hit by the housing market slowdown. Despite the reduction in overall demand for plastic lumber, PVC products have increasingly been gaining market share within the PL industry. The durability of PVC lumber products has helped fuel the gain in market share, with many products carrying warranties of 25 and 50 years or lifetime warranties. Vinyl building materials are being carried by a number of major retail outlets, making them readily available to residential consumers.

In 2007, the plight of PVC product manufacturers - in terms of trends of costs in feedstock - was similar to that of the PE lumber makers. The cost of natural gas had increased, as had the cost of chlorine.

In addition to the challenges presented by the rising costs of raw materials, the PVC industry now faces a new and unique challenge, one that does not affect other resin users and one that they most likely will not have to contend with – international competition. Because PVC is a lightweight material, and many PVC decking products are largely made as extruded hollow products, they can be shipped long distances relatively inexpensively. As a result, PVC product manufacturers in China are beginning to ship products to the U.S. which are cost competitive with domestically made PVC PL. In contrast, the much heavier weight of PE-based PL products means the cost of shipping lumber such distances makes the threat of international competition relatively low.

The PVC-Wood Composite is a product that has been on the market for about eight years but has recently gained more exposure in the industry and amongst residential buyers. The Millennium Decking System, made by Wood Composite Technologies, Inc. (Nisku, Alberta) is a wood flour and recycled PVC composite decking product that is sold throughout the U.S. and Canada. Major retail outlets, such as Home Depot and Lowes, carry Millennium Decking products. While the residential sector is the primary market for this product, this PVC-composite product has carved out a small niche market in marine and commercial applications, including wheelchair ramps, walkways and docks.

About 95 percent of the vinyl that goes into the product is post-industrial or post-consumer materials. Because Millennium Decking is made from PVC rather than PE, which is used by the vast majority of bio-composite lumber makers, Wood Composite Technologies has been unaffected by the fluctuating price of PE. In fact, the price of scrap PVC has decreased over the past year, putting the firm at a considerable advantage over its competitors.

In terms of demand for PVC-wood composite products, sales continue to be strong, despite relying primarily on demand from the residential sector. The company has seen a very slight downturn in U.S. sales as of late, which may be a result of the downturn in the housing market. A representative of Wood Composite Technologies believes the pick-up in existing home renovations and the growing green building movement has kept sales in the U.S. relatively strong. Demand for the product persists in Canada, as the housing market continues in a period of expanding there. The company is currently working with the U.S. Green Building Council (Washington) to become a LEED-recognized product and has already achieved such standing with the Canadian counterpart, the Build Green Society of Canada (Burnaby, British Columbia).

The Polystyrene PPL Industry retains a small but steady share of the overall PL market. Lines of EPS lumber and decking are manufactured by a number of firms including Benchmark Foam (Watertown, South Dakota), Polywood (Edison, New Jersey) and the CPI Plastic Group (Mississauga, Ontario). Since 2005, there have been no new entrants into the EPS lumber manufacturing arena, however, PS continues to be used in the hot tub industry and as a core material for marine applications for added buoyancy. The use of PS in building materials continues to be used in the area of insulation, and more recently, new uses have been applied in wall forming systems. Some PS lumber manufacturers are now capable of using post-industrial and post-consumer materials in their finished products (including Benchmark Foam and Polywood).

Bio-Composites are defined as those material systems that combine wood or other biological materials, e.g. flax, rice hulls, etc., within a thermoplastic matrix. These products have made the most gains in growth of market share in the last few years, enjoying an estimated 80 percent market share of the plastic decking products at one time, according to the Environment and Plastics Industry Council of Canada (Mississauga, Ontario).[1] As cited earlier, much of the growth of the bio-composite

[1] *Special News and Views Report: Recycled Plastic Lumber and Woodfibre Composites.* Environment and Plastics Industry Council of the Council of the Canadian Plastics Industry Association (Mississauga, Ontario), March 2003. http://www.cpia.ca/files/files/files_plastics_lumber_special_report.pdf.

industry was spurred by soaring resin prices, which caused some manufacturers to seek inclusions of less costly non-petroleum based fillers.

Many new bio-composite material systems have been introduced over the past few years. If the products contain over 50 percent bio-materials, the ASTM D20 definition of plastic lumber cannot be applied. The ASTM governing body for bio-composites lies within the D7 Wood Products Committee. Some of the most visible RPL manufacturers have diversified their product lines with bio-composites including Trex (Winchester, Virginia), CertianTeed (Valley Forge, Pennsylvania), AERT (Springdale, Arkansas) and Louisiana Pacific (Nashville, Tennessee).

Because bio-composites are largely used in residential applications, the downturn in the housing markets has severely affected the financial situation and stock performance of both Trex and AERT, the only two publically traded RPL manufacturing firms. Since the majority of demand for bio-composite materials comes from the residential sector, bio-composites seem to have been hit hardest by the slow down in housing, more so than other sectors that supply PL for structural, commercial and park and recreation applications. Falling prices for traditional wood-lumber has also had a negative effect on the demand for bio-composites.

Markets for RPL

According to the Freedonia Group, an industry analysis group in Cleveland, demand for wood-composite and plastic lumber is expected to grow by ten percent annually, reaching $5.4 billion by 2011.[2] However, a number of market forces have come into play that may affect that growth and have created mixed performance for the various market sectors.

As noted above, the housing market downturn has had a mixed effect on PE-based PL manufacturers. Demand for materials is down overall as the construction of new housing slowed considerably and overall values of existing homes dropped, making obtaining financing for remodeling projects and additions difficult. It is estimated that 50 percent of all wood-plastic composite volume sold is deck board.[3] Analysts generally agree that the decking business is closely tied to remodeling and repair, rather than new home construction. According to Principia Partners (Exton, Pennsylvania), 88 percent of wood-plastic decking sales is for remodeling and repair purposes.[4]

While some analysts of the wood-composite industry remain optimistic that remodeling and renovation projects will continue to float the industry, reports from RPL manufacturers that make products for the residential sector are less optimistic. Manufacturers of residential products in all technology areas report varying degrees of a decrease in demand. The two publically traded bio-composite manufacturers, Trex and AERT, which focus heavily on products for residential use, have suffered a difficult year. A review of Trex and AERT Securities and Exchange Commission filings and other public announcements, lends insight into the experience of RPL manufacturers over the year.

---

[2] *Composite and Plastic Lumber*. Freedonia Group, Inc. September 2007.

[3] Karen Wood, "Wood-filled composites jump off the deck." *Composites Technology*, December 2007, http://compositesworld.com/ct/issues/2007/December/112269/3.

[4] Karen Wood, "Wood-filled composites jump off the deck." *Composites Technology*, December 2007, http://compositesworld.com/ct/issues/2007/December/112269/3.

In 2007, Trex was forced to close its Olive Branch, Mississippi plant, which resulted in the layoff of 115 employees, and an additional 25 employees have been let go at the headquarters plant in Winchester, Virginia.[5] Early in 2008, Trex chose to hire a new CEO to return the company to profitability. Overall sales for Trex were down significantly over 2006. As of the third quarter filings (end-of-year fourth quarter filings were not available at the time of this report), sales were down $12.1 million in the third quarter period and down $6.1 million for the nine-month period overall. Net losses for the third quarter alone were $41.7 million and $34.9 million for the nine-month period.

Similar struggles continue for AERT. At the close of the year, AERT was notified of NASDAQ listing deficiency, meaning the firm's stock had fallen below the $1 mark for 30 consecutive business days. If the firm cannot post stock sales above $1 for ten consecutive by June 18, 2008, the stock will be delisted.

Unlike Trex, AERT's third quarter sales were up almost $4 million over the same three-month period in 2006. However, overall net sales for the nine-month period were down $4.1 million over the same period in 2006. AERT also cites higher operating and material costs as contributors to the decrease in overall gross profit margin, which was 12.3 percent for the first nine months of 2007 compared to the gross profit margin of 24.2 percent enjoyed during the same period in 2006.

While the operating, supply and demand situations of all companies are unique, the information that is available about these two firms, could be considered characteristic of the experiences of other PL manufacturers that also rely heavily on demand from the residential sector.

RPL manufacturers that make products for the commercial, marine, parks and recreation, and railroad applications have enjoyed some market growth over traditional wood products. The industry as a whole has also benefited from the "green" movement that has driven consumers to change purchasing practices and seek more environmentally friendly products – such as recycled plastic lumber. An additional opportunity for the demand for plastic lumber to increase as builders seek Leadership in Energy and Environmental Design (LEED) certifications for buildings as offered under the U.S. Green Building Council's rating system. Integrating plastic lumber into building projects is just one of a number of ways to move a building project toward LEED certification.

Pinpointing precise sales volume for the RPL market remains a difficult task given that most manufacturers remain privately held corporations or are operating divisions within larger corporations and their sales volumes are not presented in a format that is easily identifiable as a sales analysis tool. While the decking market continues to be leader in RPL sales volumes, with much of those sales coming from bio-composite products through retailers, sales in this area are slowing. Mega-retailers, such as Home Depot (Atlanta, Georgia) and Lowe's (North Wilkesboro, North Carolina), have helped to increase consumer awareness about the availability of RPL alternatives. This activity, coupled with the environmental concerns of pressure treated lumber materials and the green building movement, has helped fuel the purchases of PL that are being made.

One PL sector that showed significant growth in 2007 was RPL ties for the railroad industry. Demand for plastic rail ties grew considerably over the past year. Capacity has adequately expanded to meet demand, as existing manufacturers have

[5] Lorraine Halsted, "Trex price continues its decline." *Winchester Star*, November 24, 2007, http://www.winchesterstar.com/article_details.php?ArticleID=2826.

grown and some new manufacturers have come on-line. One firm in particular, Tietek (Marshal, Texas), a leading manufacturer or RPL railroad ties, saw large increases in demand in 2007. The firm was awarded a contract from the Chicago Transit Authority. As a result, the tie maker will supply approximately 64,000 ties for Chicago's system. Prior to the contract, Tietek had already supplied the CTA with ties for maintenance and replacements along the 222 miles of CTA tracks. Union Pacific also expanded its agreement with the manufacturer. To meet growing demand, the firm consolidated operations and has doubled its tie production capacity.

In 2004, it was estimated that just 300,000 of over 20 million ties purchased annually in the U.S., or 0.015 percent, were plastic material.[6] While demand for plastic rail ties has grown, so have the miles of rail in the U.S., so the percentage of plastic ties in the system today is likely consistent with the 2004 estimation. Plastic railroad ties have been in commercial use for about 12 years now, which has provided substantial opportunity to demonstrate the superior performance of RPL to wood ties in certain conditions. While the merits of plastic rail ties are becoming more widely recognized, it is in the higher-value applications that RPL railroad ties exemplify their value. In environments that present extra challenges - areas requiring high life-cycle performance, that carry extraordinarily heavy loads, open-rail applications, longer tie-switch applications and caustic or wet environments - the durable properties of plastic ties become more desirable.

The number of manufacturers in the RPL railroad-tie industry for the most part remains fluid, with a number of firms entering and leaving the market over the decade. Several companies that launched attempts into the tie market have not lasted, while new companies utilizing different technologies and materials have emerged. Over the next few years, it will become clearer which of the available technologies will be able to meet and satisfy the needs of the industry over the long term. Currently, Tietek believes it is the leader in RPL tie sales both in the U.S. and internationally.

Like other sectors of the plastic lumber industry, the rising price of materials does present challenges in keeping production costs down. Despite the potentially major challenge of rising material costs, there are a number of positive factors that are helping to fuel demand for composite ties. As the railroad industry continues to green itself, the perceived use of creosote-treated wood and the use of hard woods as being less environmentally friendly is further helping to boost the image of RPL ties. That coupled with the proven success of RPL ties – in both performance and life-cycle cost savings - over the past years, it is expected that railroads will continue to integrate these products into maintenance and repair operations, particularly in demanding environments.

Business Cycle Development

As described in previous *State of the Industry* reports, the RPL industry business cycle can be characterized as having three distinct stages. The initial stage of the industry was marked by consolidation through the acquisition of smaller firms by larger firms. The second stage of the RPL business cycle could be viewed as the start-up or re-start-up phase, where many of those displaced by past consolidation or those who had been hindered by now-expired non-compete agreements, emerge in the market. The

[6] Jan H. Schut, "They've Been Working on the Railroad." *Plastics Technology Magazine Online*, April 2004. http://www.plasticstechnology.com/articles/200404fa3.html.

magnitude of activity in this second stage was hard to fully understand because much of the emergence or re-emergence was done without much public disclosure.

Today, the RPL industry finds itself in a more mature third stage where the development of new technology and products has earned RPL greater legitimacy in the marketplace. Many of the plastics lumber sectors discussed in this report are in a maintenance, rather than growth, phase. Because many of the uses for RPL have been long established, manufacturers are focused on meeting long-term demand rather than expansion.

In terms of public efforts to spur market development, fewer grants seemed to have been awarded to RPL manufacturers in 2007 as compared to previous years. This may be due to the fact that the RPL industry is being perceived as more mature, and public investment to further grow and develop the industry may not be seen as necessary as it has in the past.

Raw Materials

Energy prices reached historic highs in 2007. Since the price of virgin resins track closely to that of natural gas and crude oil, and the price of post-consumer, post-industrial and off-grade resins are affected by the virgin pricing, 2007 proved to be a difficult year in terms of material costs. In 2006, the price of recovered HDPE stabilized significantly from the exorbitant climb that occurred in 2005. However, in the later months of 2007, prices once again edged close to the historic highs of 2005.

If the economic trends of publicly traded firms in 2007 can act as a weather vein for larger market trends in the industry, they demonstrate the magnitude of the effect high raw materials costs have had on profits for RPL manufacturers.

While the price of natural gas in 2007 was not as volatile as it was in 2005, which was due in large part to interruption in production as a result of damage to refineries from Hurricanes Katrina and Rita, year-end prices topped $8.00 per MMBTU. Those that rely on natural gas products, such as PE producers, did find relief when prices dipped in September of 2007, but prices quickly rebounded and hit a year high in November (Figure 1).

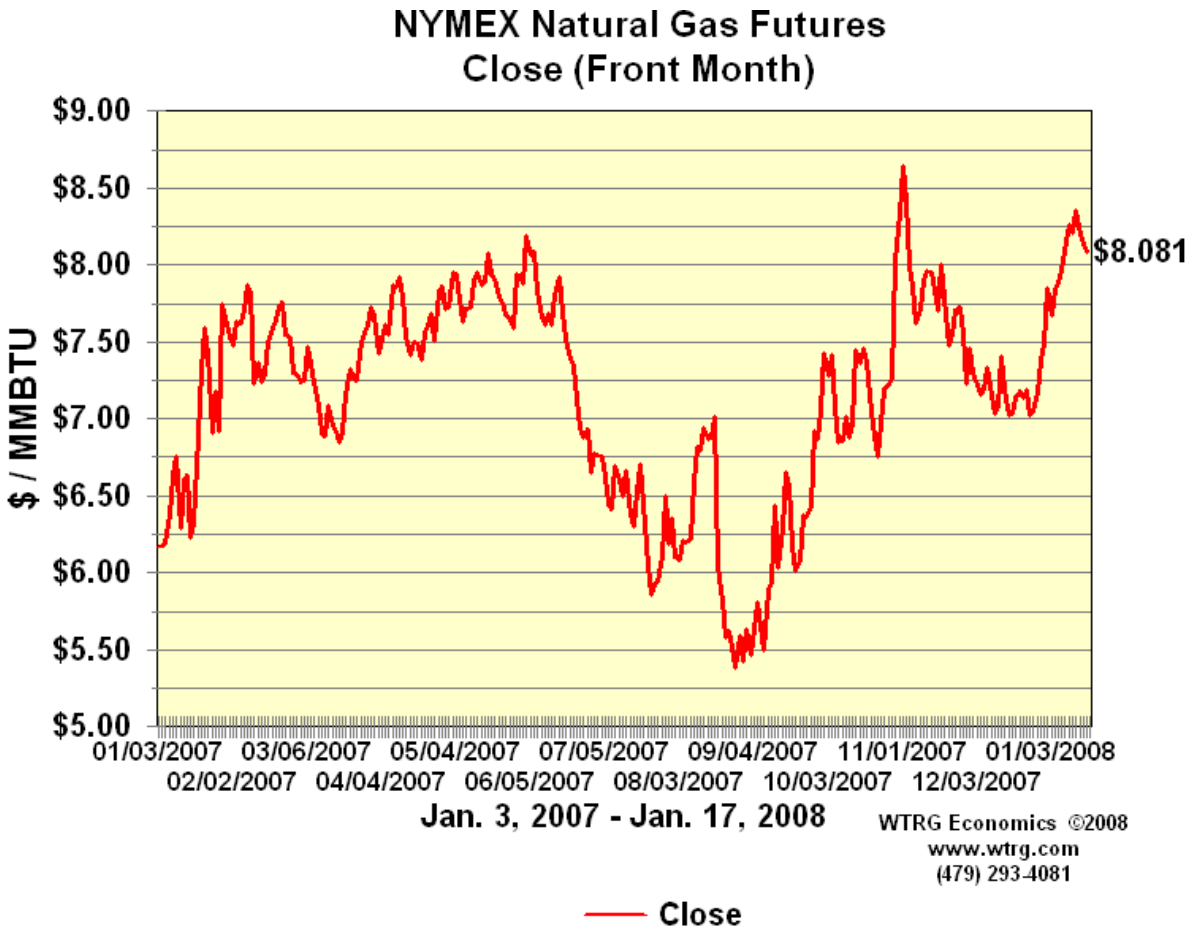

Figure 1. Source: NYMEX Natural Gas Futures Prices, http://www.wtrg.com/daily/ngfclose.gif

PL manufacturers that rely on other types of virgin resins, such as PVC, were also hard hit. In the U.S., PVC is made from natural gas and most often sodium chloride. In addition to the price of natural gas once again on the rise, the price of chlorine also increased as the year progressed.

RPL manufacturers that use recovered PE largely consume film plastic (LDPE, LLDPE and occasionally HDPE) and/or HDPE containers. Following the sharp pricing increase in 2005, the price of post-consumer HDPE stabilized in 2006, returning to 2004 levels by the end of the year. In 2007, three factors contributed to rising prices of recycled HDPE, the rising price of virgin materials, increase demand for post-consumer resin and rising exports. The price of recycled HDPE began edging higher at the beginning of the year and never stopped. The price of baled homopolymer HDPE containers was almost 40 cents per pound by year's end (Figure 2). A new interest in including post-consumer content in packaging materials helped boost demand and further increase prices. One effort in particular which has boosted interest in recycled HDPE is the Wal-Mart (Bentonville, Arkansas) packaging scorecard, which rates suppliers on a number of factors, including the use or recycled content. Lastly, exports of HDPE scrap

by November of 2007 were up 41.6 percent over the same period in 2006, further increasing demand and bumping pricing higher.[7]

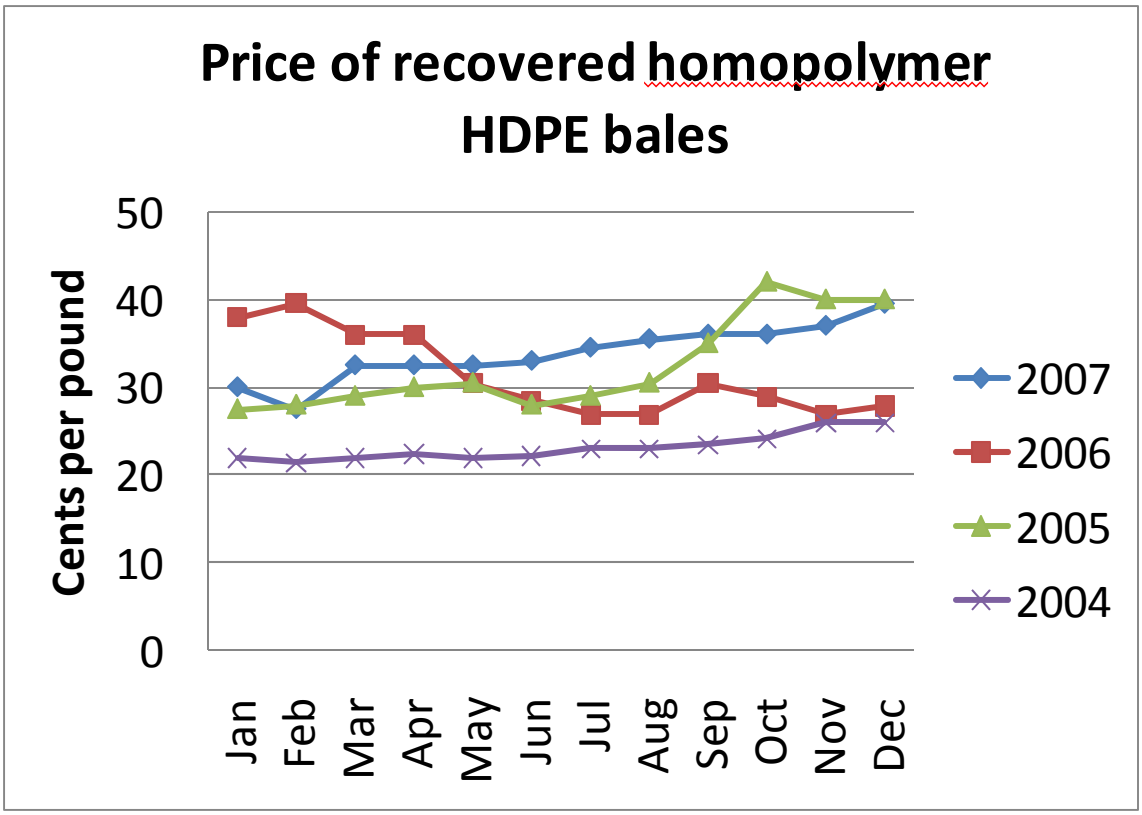

Figure 2. PCR HDPE bale prices for 2004-2007 (*Plastics Recycling Update*)
Prices are based on truckload picked up in the eastern U.S.

Processors and consumers of scrap PE continue to look for new recovery opportunities. New focus is being given to plastic bag recycling, and efforts are being stepped up to improve collection opportunities both inside retail establishments and in residential collection programs. Consumers of scrap PE are also taking steps to vertically integrate operations. For example, AERT has secured a $13.5 bond to create a "plastics mining and reclamation facility" near Watts, Oklahoma. The move is intended to reduce production costs. Also, firms such as Tietek are looking for new material streams that might otherwise be headed to the landfill.

For consumers of other post-consumer resins, such as PVC and PS, material prices have risen. For example, recovered PVC exported from the U.S. moved between 22.22 cents and 24.57 cents per pound in 2007.[8] At year's end, the price was 22.38 cents per pounds on average.

[7] U.S. Department of Commerce, *Scrap plastic export data*, 2006-2007.
[8] U.S. Department of Commerce, *Scrap plastic export data*, 2007.

The Plastic Lumber Industry in a Competitive Market

The RPL industry is beginning to mature, transitioning from a relatively young industry fighting for a place in residential and commercial building materials market, to becoming a relatively recognized and more widely accepted product. The consuming public is more knowledgeable about the differences within the various materials systems and how they factor into making the appropriate choice for their project needs.

How the industry handles the current business challenges today will greatly influence the characteristic of the marketplace tomorrow. These are just a few questions that highlight some of the predominant challenges manufacturers can expect to confront:

- Will struggling RPL manufacturers, particularly ones that rely heavily on residential demand, survive a sustained lag in the housing market?

- Will the green moment, and increased interest in PL from LEED certification seekers, help growth in RPL's overall market share against traditional wood products?

- Will diversification of services and products that serve multiple sectors be a critical factor that ensures survival of some RPL manufacturers?

- Will the new entrants into the RPL railroad tie market contribute to the overall positive view of plastic composite railroad products, or if these new technologies fail, will it detract from the overall image of RPL use by railroads?

- Is the opportunity for new start-up and smaller companies to grow gone for the time being?

- Will bio-composite manufacturers further gain market share as the price of PE edges close to near-record prices once again?

- Because RPL manufacturing is inherently more costly than wood, will the industry devote resources in researching and developing ways to continue to make strong products, but with fewer pounds of materials, in order to be price competitive?

Continuing work for the development of industry

RPL buyers continue to be vocal about the needs for material consistency, quality standards and timely delivery. For this reason, the recycled plastic lumber industry needs to be represented by a competent trade association. There needs to be a renewed commitment by all primary manufacturers, design engineers, researchers, marketers and end users to have a sound trade association representing their market interests. Focus needs to continue to be directed on working with manufacturers, such as the dairy industry, to ensure their packaging can continue to be reclaimed by industries such as

plastic lumber. The core strengths of the PLTA are its work within the ASTM and its efforts to provide a forum where old and new members can discuss industry issues.

Membership applications may be downloaded from the association's website, www.plasticlumber.org.