

## Pallet and Logistics White Paper

Pallets are defined as a portable platform for handling, storing, or moving materials, cargo, and packages (as in warehouses, factories, vehicles, or other forms of transportation). Pallets facilitate mechanical handling of stacked goods with fork lift trucks. Pallets often serve as a base for assembling, handling, sorting, storing, and transporting goods as a unit load. Job specific pallets come in different designs, dimensions, and materials; such as two-way entry, four-way entry, box, post, steel, or plastic. Pallets are often referred to as a "Skid" since they are often "skidded" from one location to another.

Pallets have been used for hundreds of years. Unfortunately, most pallets in circulation today are still made using the same material, and technologies used from hundreds of years ago. (wood, saws, hammers, and nails)

Pallets are used extensively in logistics throughout the world. Collectively hundreds of millions of pallets are produced each year creating revenues of over six billion dollars for the pallet industry. Unfortunately, close to 97% of all pallets are made of wood. In 2004 over 814 million pallets were produced or repaired with 800 million being made of wood. It is estimated that up to 35% of all the hardwood trees harvested in the United States end up in wood pallets according to The National Hardwood Lumber Association. Some estimates place this as high as 50%. This accounts for nearly 12% or more of all wood species being harvested. Every year nearly 2 billion wood pallets are in circulation in The United States alone.

Since wood pallets are often only used for a onetime shipment this becomes a substantial financial expense, and creates a significant environmental impact. The expense has to ultimately be partially recaptured in the price to the consumer of those goods. The environmental impact affects us all. In some cases, wood pallets can be reused, but statistics indicate they generally become damaged after an average of 3-4 uses. While the wood pallet industry has repair services, and attempts to do some recycling through converting spent wood into such things as animal bedding, wood pellets, and landscape mulch, much of this wood still ends up in landfills. Many businesses forego repair, or reuse, and give old pallets away to people who use it for firewood. Wood pallets not disposed of often create an eyesore, safety hazard, and space issues.

## **What then are the costs and concerns with the use of wood pallets?**

**There are environmental costs.** As noted above a large percentage of trees end up in pallets, and the environmental impact of equipment used within forests to harvest these trees and transport them to conversion locations can be significant. Since much of this wood ends up being burned it introduces additional carbon into the atmosphere.

**There are financial costs.** For the companies purchasing wood pallets for moving materials there is a price paid which is not directly recoverable. Initially this price may seem to be the cheapest route to take and the most economically sound decision. However, upon further investigation this may not be true. Not only is there the cost to purchase, but wood pallets are also often involved in employee injuries, or product damage. Injuries can occur if an operation builds their own pallets, due to splinters while using, slip and falls from broken pieces laying on floors, or incurred while trying to fix damaged pallets. Since wood pallets often have pieces break off as they encounter fork trucks it often creates debris. In production facilities this can contaminate other materials, create trip hazards, and affect work flow. Wood pallets can also absorb hazardous liquids, become covered with grime, contain insects, and ultimately increases cost to the consumer.

### **Other Concerns Associated with the use of Wood Pallets.**

Many consumers are beginning to demand improved standards within the logistics chain. The FDA has banned the use of wooden pallets in conjunction with certain food processing operations, because of the risk of contamination. The FDA intercepted and tested wood pallets during 2007 and found approximately 10% contained E. Coli, Listeria, and other bacteria. The treatment of wood pallets is another concern. Composite wood pallets can contain formaldehyde which is a known carcinogen. This may be absorbed by food when shipped or stored thus entering the human food chain. Heat treatments and fumigation against insects with the toxic chemical Methyl Bromide is also a grave concern.

Wood pallets are also a fire hazard. When dry wood pallets have a very low flash point. Fire in stacks of wood pallets can accelerate out of control rapidly which creates a significant risk. Burning wood pallets also give off a number of toxic fumes.

### **There are growing public image costs and opportunities.**

As populations become more and more aware of the need to reduce negative environmental impacts, and purchase items handled in a sanitary fashion demands will grow for pallets to be made from alternative materials rather than from wood. Over the past several years, members of the environmental movement have begun questioning the use of wood for pallets. Thus companies who continue to use wood may lose business to competitors who switch to more advanced pallets made of alternative materials. In some instances, pallets are visible in point of sale retail locations. How do they affect the perceptions of customers? In other cases, pallets are only seen behind the scenes of business to business logistics. How does the type of pallet used infiltrate into perceptions in these cases?

While pallets may not be viewed as a significant item by logistics and marketing departments they are still a significant factor within the “packaging” sphere that should be considered. According to an article by Jim Butschli, editor of Healthcare Packaging he states, “Packaging can answer a brand’s complex challenges, including safety, sustainability and retail experience.”

WestRock’s fourth-annual Packaging Matters Survey surveyed 2000 U.S. consumers, and found that packaging is extremely important to satisfaction and has significantly increased as a consideration over the past two years.

The study showed:

**Packaging is as important as brand.** The importance of packaging to product satisfaction has increased over the past two years from 18% to 26%.

**Functional features drive satisfaction.** More consumers say they have purchased a product again because of the packaging’s functionality (60%), while (38%) say they have done so due to aesthetics. Packaging also has an impact on brand loyalty. Around 35% of consumers say they have switched brands because of new packaging.

WestRock also surveyed 200 professionals who work at consumer packaged goods companies and have an influence over brands’ packaging decisions. The survey found that these packaging professionals also recognize the importance of packaging, but while 66% of packaging professionals say that their brand is already making a strong effort to improve packaging to meet consumer’s needs, only 14% of consumers strongly agree with that statement. This indicates how much there is to learn and points to a great opportunity for improving consumer satisfaction, driving purchasing intent, and creating better brand loyalty.

## Plastic Pallet Benefits Arise

Forward thinking industries are now starting to demand pallets made from alternative materials such as plastics and metals. Of the alternatives, plastics offer the widest array of flexible options for design, performance, customization, robotic interface, worker ergonomics, financial benefit, among many other benefits. Thus pallets made from plastic are generally considered to be the best alternative choice. There are many reasons which support this conclusion. Plastic pallets are generally lighter in weight, and can have RFID tags easily included, as necessary, and can be designed to nest within each other for reduced storage, and shipping space when not loaded. All of these benefits greatly improve a number of logistics factors. Shippers of food, pharmaceuticals, medical, aerospace, and other high value items want their products to be free from insects, fungus, other contaminants and debris which are associated with wood pallets.

Plastic pallets used in conjunction with food products cannot contain insect infestations. Plastic pallets are obviously resistant to absorption of liquids. They can also be washed, sanitized, and disinfected without harm to the plastic. Plastic pallets can be designed for specific applications relative to size, weight bearing requirements, stack heights, nesting, colors, orientation striping, fork entry, attachments/accessories, and many other features.

Plastic pallets thermoformed of High Density Polyethylene are fully recyclable. Thus new pallets can be formed using either virgin resin, fully recycled resin, or a blend of the two. If pallets become damaged or outgrow their useful life they can be ground up, re-extruded and formed into new products. This reduces material going into landfills or being burned creating additional harm to the atmosphere.

The lower weight of plastic pallets translates into lower costs for shipping. The average weight of a plastic pallet compared to wood is significantly less. It is estimated that the average weight of a plastic is 30% less than a similarly sized wood pallet. Plastic pallets can also be formed so they can nest in each other to reduce space to ship when not loaded with product. Thus items shipped by weight or size can achieve much lower costs by utilizing plastic pallets. This means less fuel and number of trucks on the highways which reduces carbon emissions.

Companies who are using plastic pallets are also seeing benefits for their employees. Since plastic pallets weigh less, employees are incurring less back strains or other injuries while moving them around. Plastic pallets can be designed with handholds molded in, or other attachments such as retractable belts, which greatly improve ergonomics for employees. Unlike wood pallets that often have broken pieces of wood, sharp nails, and have rough surfaces which can cause a multitude of injuries, plastic pallets are smooth.

Relative to danger with flammability plastic pallets have a higher flash point than wood, and are generally considered to be, as good, or better than wood pallets in the factor of fire safety. Plastic pallets can also be treated with a fire retardant which can certify them to add no added fire risk to a warehouse.

Load bearing capacity is another consideration. A wooden pallet can be expected to take loads up to 2500 pounds. Plastic pallets can be designed to carry loads up to over ten times this amount. This translates into loads of 25,000 pounds or more. Design considerations might include heavier gauge plastic sheets, twin sheet construction, or metal formed into the pallet to lend additional support.

Product damage also has to be considered. Plastic pallets can be designed and tested for how they will perform in the field. Designs can be created to maximize the protection of products. The food industry has determined that 28% to 44% of product damage making it un-saleable is due to crushed, dented, or collapsed products. What are the costs of this? What are the costs to your industry?

## **Should Industries Investigate Alternatives?**

Industries around the world are spending billions and billions of dollars to move items from one location to another. What are damaged products costing? In The United States the Federal Highway Administration Department of Transportation conducts a study relating to logistics costs, as a part of U.S. Gross Domestic Product. Needless to say it is a very complex issue of study. The latest study from 2002 can be found at [http://www.ops.fhwa.dot.gov/freight\\_analysis/econ\\_methods/lcdp\\_rep/index.htm](http://www.ops.fhwa.dot.gov/freight_analysis/econ_methods/lcdp_rep/index.htm)

This study conducted in 2002 by the CASS Annual State of Logistics Reports indicates total logistics costs were \$910 billion (\$910,000,000,000)! This was the equivalent of 8.7% of The U.S. gross domestic product. Much of this cost comes from wood pallets which are only used one time, ending up in landfills, or burned. How much is your company spending? Has your organization calculated this cost including injuries, and labor to build wood pallets? Are there new creative solutions, or alternatives for reducing this unnecessarily high cost? At Vantage Plastics we believe there are. Please contact us to explore how we might develop a better approach for your organization.

Industries have had the habit of using wood pallets. Without analysis they seem cheaper than the alternatives. However, once further investigation occurs this cannot be taken as fact any longer. Modern logistics can turn to new and creative ways to drastically improve outcomes.

### **Actual Case Study of Life Cycle Cost Analysis of Wood versus Plastic Pallets**

A large OEM automotive company was using 96" x 78" wood pallets to ship parts. Each of these wood pallets was costing \$7 to repair, as well as an estimated \$150 in shipping cost per truck for in state shipments and \$550 for out of state shipments with a density of 72 per load. These wood pallets were damaged and needing to be repaired after 1 or 2 shipments. This OEM required 24,000 pallet loads per year. The OEM decided to try using plastic pallets as an alternative. They found that these pallets lasted an average of 50 trips without damage, and due to a lighter weight saved them significant fuel costs. In this case using custom designed plastic pallets manufactured by Vantage Plastics, they only needed 480 pallets at a cost of \$117.68 per pallet for a total of \$56,500 (assuming 1 pallet lasting for 50 trips. When they were using wood pallets they needed 8,000 pallets at \$27 per pallet (assuming 1 pallet lasted 1.5 trips) plus repair costs for a total of \$304,150. Thus switching to plastic pallets designed and manufactured by Vantage Plastics this large OEM estimated a savings of \$247,650 per year!