

Adapt to China's Shipping Environment

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Abstract: *Many United States companies have recently been moving their manufacturing over to China for reduced labor costs. However, many did not take into consideration the unique shipping and handling environment within China. These companies ended up experiencing high damage levels. This paper will discuss the differences in China when it comes to shipping and handling, and how to design and test packages to protect the products that will be shipped.*

Introduction

China is rapidly becoming a world leader in outsourcing of manufacturing jobs from developed countries. One of the major players in this outsourcing of jobs is major manufacturing companies based in the United States. Since the 1990s, companies have been moving these manufacturing jobs to China without a proper understanding of the shipping and handling environment. For some product lines, companies were reporting damage rates from fifteen to twenty percent (Baird & Young, 2004a). Since that time, there have been several studies done, and some still in progress. Many individual firms with the support of major manufacturing companies have conducted these studies in order to better define the shipping and distribution environment of China. Some of the companies cooperating with these studies include: Dell, Kodak, Hewlett-Packard, IBM, Intel, Johnson & Johnson and Lansmont (Baird & Young, 2004a; Joneson, 2004). With this information, a packaging professional can define package and test specifications for products manufactured and distributed in China. Packages must adapt to a completely different environment when shipping within mainland China.

Shipping Equipment Requires a Change in Package Design

One important point to understand before creating a package for products being shipped in China is the type of shipping equipment that is used. The modes of transportation and road conditions in China differ from those used in the United States. Some of the tested methods and traditional package designs may not be applicable for the environment in China. One major study on China's shipping environment was conducted by Terry Baird and Dennis Young with many large corporate sponsors. The main types of trucks used in this study were eleven-foot straight open trucks, eighteen-foot straight open trucks, and fifteen-foot open trucks all of which had steel spring suspensions.

Also used were a thirty-five foot enclosed semi-trailer and a fourteen foot enclosed trailer (Baird & Young, 2004b). The United States uses more advanced suspension systems, including air bag suspension, which "provide a relatively low stiffness and therefore a low bounce frequency for a given axle load" (OECD, 1998). The type of shipping truck has a major impact on the type of packaging an engineer will use when creating packaging for specific products. These trucks have different resonating frequencies than trucks from the United States, causing a possible change in the test standard if shipped in China.

The road conditions in China are noticeably different from those in the United States, and must also be a major consideration for packaging engineers. The first key component that will be examined is the fact that eighty percent of China's roadways are unpaved as opposed to the United States' ten percent unpaved (Baird & Young, 2004a).

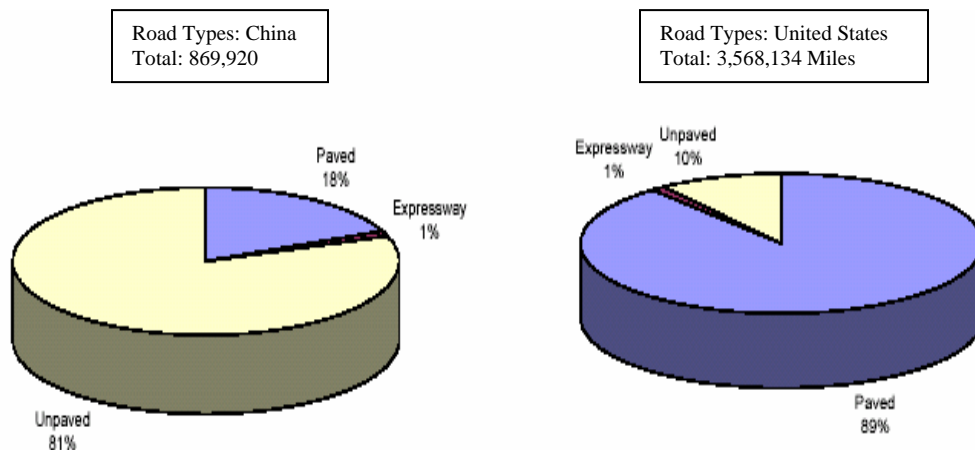


Figure 1. Road Types in the United States and China (Baird and Young, 2004b)

For example, Fortune Magazine describes the major metropolis of Chongqing as “a labyrinth of half-finished highways” (Thomlinson, 2004, ¶ 1). This city, once China’s capital during World War II, has thirty-one million people (Thomlinson, 2004). Traveling on unpaved or unfinished roads can result in accelerated vibration problems within a package. Another study is currently being conducted by Lansmont to determine vibration data on China’s major distribution roads (Joneson, 2004). The study will involve performing over four hundred individual measurements within seventy variables in China in the course of one year (Huntley, 2004). Even after the research that has already been done on China’s road conditions, there is still much to learn about the roads that connect its more than 3.4 million square miles. (“China,”2003).

China also has many unique types of transportation, which are greatly attributed to the mass of manual labor the country has. These types of transportation include carrying of small parcels by hand and delivery of packages by bike (Baird & Young, 2004a). The bikes are old and out of date and mostly carry more than one package at a time. This type of transportation can lead to more accidental drops than a more automated process (2004a).

Distribution Environment is Severe

The distribution and handling environment within China lacks proper handling equipment. This is a key area of the distribution cycle that the package goes through once at a distribution center or warehouse. In the United States automation is used for this process, which eliminates manual handling and greatly reduces accidental failures. In China there is a large surplus of manual labor, and it is widely used.

One time when a package is vulnerable to damage is when the truck or trailer is loaded or unloaded. One major set back for Chinese companies is the lack of shipping docks (Baird & Young, 2004a). To get around this disadvantage, trailers are loaded and unloaded manually by laborers and hand carried to and from the warehouse (Baird & Young, 2004a). This could result in dropping or tossing the package off the truck to other workers or into a stack before being moved inside the warehouse. Since no pallets are used inside of the trucks, there is little use for conventional fork trucks. However, fork trucks may still be seen during this process. They are used to hoist workers up to unload the top stack of packages on the truck (2004a). This increases the potential drop height of the package.

Once inside the warehouse, handling is very similar to the loading and unloading process. It is very labor intensive with multiple handlings of the package. The lack of fork trucks and pallets allow the unitized loads to become unstable by not having a solid base or a maximum height to stack the packages (2004a). For example, if a package became damaged during the unloading

process it no longer has its structural integrity. If this package is placed towards the bottom of a unitized load, the whole stack will become weak because of one package. Multiple handling of each individual package plays a large role in the large damage rates inside of the warehouse.

Shock and Vibration Data Show Unique Levels

The China Project was conducted by Terry Baird, who has twenty-five years experience in package testing and development, and Dennis Young, currently a senior consultant for packaging and packaging tests. During the project, several charts were created that documented the shock and vibration levels a typical package would see. This study was intended to define the shock and vibration environment in China. It was started in 1998 and took 4 years to complete (Baird & Young, 2004a).

To compare the results of The China Project to the levels that are tested to in the United States, Baird and Young compared their results to a common ISTA test spectrum and the UPS data. The X-axis shows the vibration frequencies that were measured by the recording instrument. The Y-axis shows the intensity levels that were recorded during each frequency (see Figure 2).

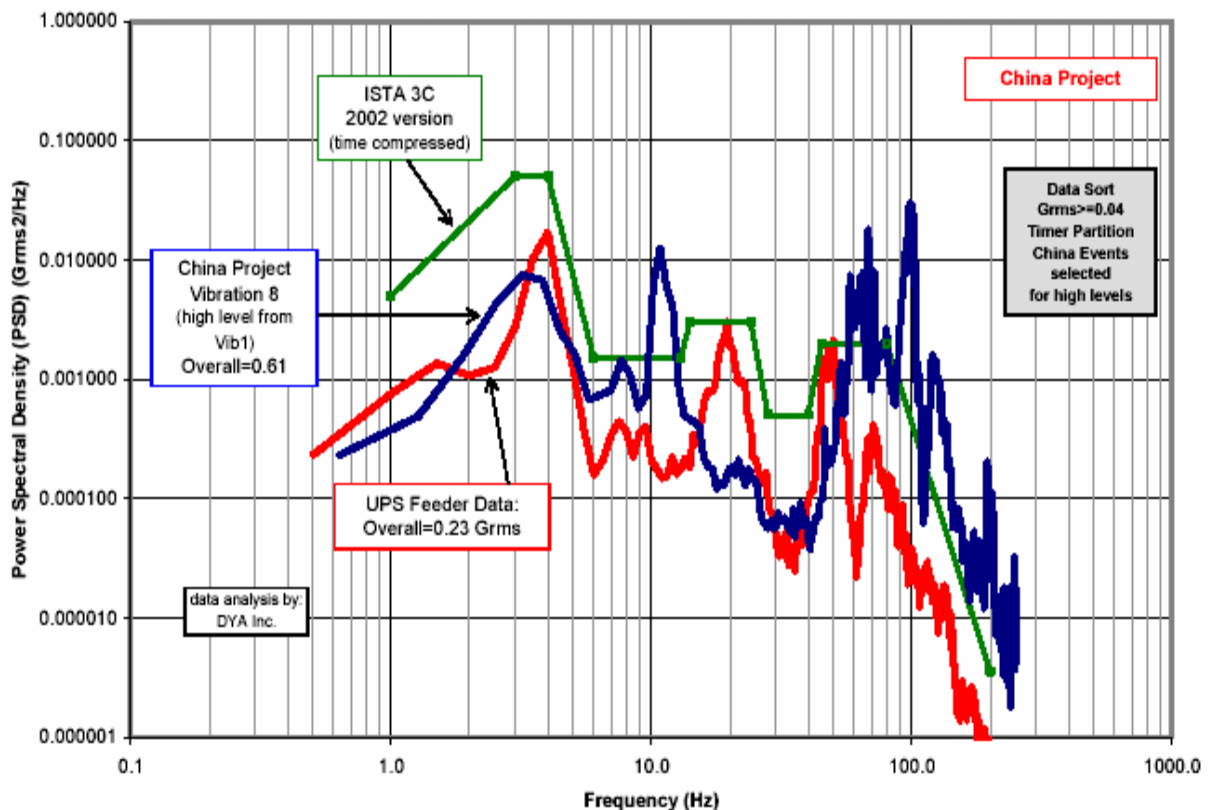


Figure 2: Vehicle Vibration Environment (Baird & Young, 2004b).

Figure 2 shows that the ISTA spectrum tests above what was seen during The China Project, except during a frequency between ten and eleven Hertz which could be considered a critical frequency. The sharp spike at ten Hertz is at a high enough level that it would need to be looked at carefully by a packaging professional with a product that has a critical resonance at that frequency. There is also a higher incidence over about 60 Hertz.

The data about dropped packages that was collected from The China Project also shows packaging professionals different variables to account for when shipping in China. The handling

environment that the package must go through is one in which drops are almost the norm. Figure 3 displays the summary of the results from this project.

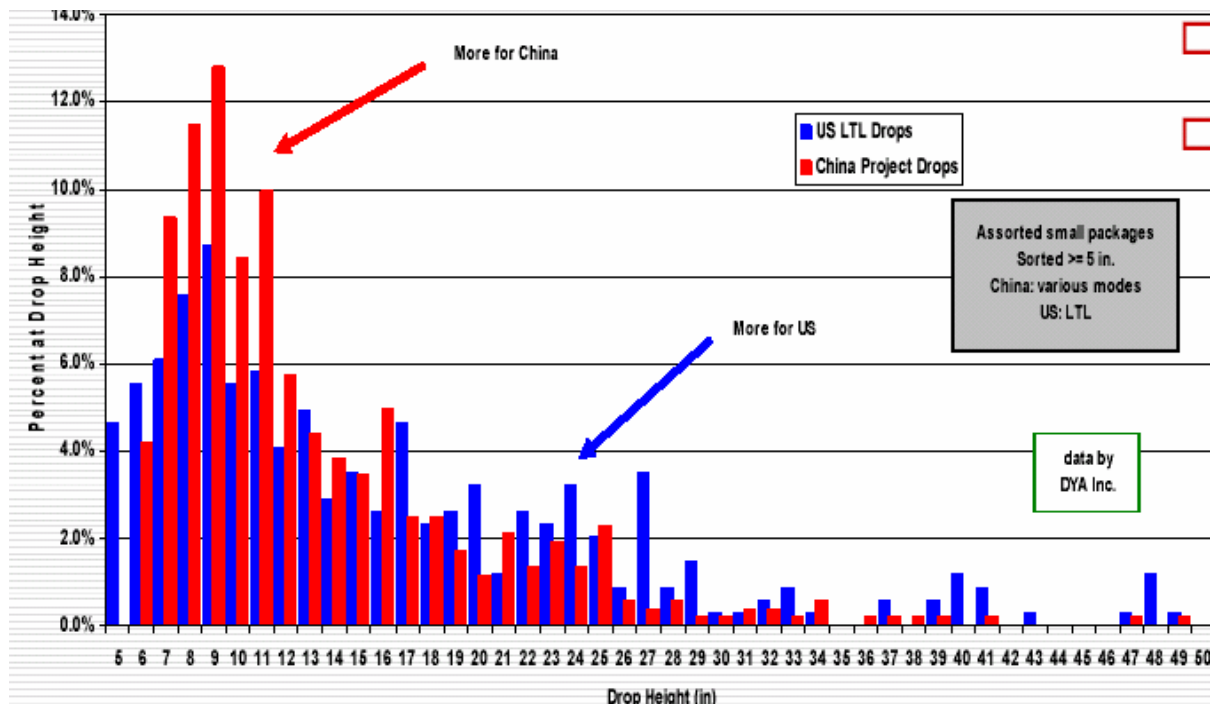


Figure 3: China / US Drop Comparison (Baird & Young, 2004b)

Figure 3 shows, on the X-axis, the specific drop height in inches compared to the percentage of the totals drops during a trip at that height. What one can see from this graph is that, at a lower drop height, China has a higher percentage of drops. This area ranges from 7 inches to seventeen inches. After that range, the United States has a higher percentage of drops around eighteen inches and above. Higher drops are a rare occurrence. The high percentage of the smaller drops from China should be a concern to a packaging professional due to repeated drops reducing the resiliency of the cushions inside of the package. Once some cushions are compressed they lose a portion of their cushioning characteristics.

Handling in a Climate Change Impacts Packages

As would be expected of any geographic area, there is a climate difference between the United States and China which could impact the packaging material used for different products. The climates in China are very diverse, ranging from tropical in the southern regions to sub-arctic in the northern regions ("China,"2003). For example, in Shanghai, a major manufacturing area in China, records an average high of eighty-eight degrees Fahrenheit in July and an average low of thirty-four degrees Fahrenheit in January. The average precipitation level can reach up to 6.8 inches in June with the dew point averaging seventy-six degrees Fahrenheit in July ("Climate," 2000).

For a comparison, Minneapolis has a high average dew point in July of sixty degrees Fahrenheit with the high average precipitation level being 4.1 inches during June ("Climate," 1999). This shows that the humidity is a little higher in China, with more average rain fall. This is a relevant concern when shipping in open container trucks, and unloading and loading trucks outside without loading docks. Without protected warehouses, the packages would further be susceptible to these external weather conditions. A packaging professional should explore the options of protecting their product with various types of barrier bags or additional protection.

With a bag, the product would be physically protected from the environmental elements even if the outer carton may not protect it.

Import Regulations are an Implication to Packaging

If a package would ever need to be imported into mainland China from the United States, a series of import regulations would need to be complied with before the shipment would be accepted. To begin, if a company wants to import packages into China they must first become licensed through the Ministry of Commerce (MOFCOM) and meet a minimum capital requirement. For some products, for example plywood, a license will automatically be granted to the company, but this license is only used for tracking that specific commodity ("Import Regulations," 2004). One recent change to the regulations includes "all companies (Chinese and foreign) as of July 1, 2004 have the right to import all but a limited number of good [sic] reserved for importation through state trading enterprises" (2004, ¶ 3). This means that the government of China will allow unlicensed companies to import only a certain number of products. For products imported into China, a number of tariffs are applied based on the transaction value of the goods (2004). This would also cover packing charges, freight, insurance, and other charges that took place prior to the unloading of the goods at the place of destination (2004). With all these charges, the average tariff on an imported product in 2002 was 12.1%, with a commitment from the World Trade Organization to lower that to 9.8% by 2008 (2004). With these restrictions and tariffs on importing goods into China, it is very costly for companies to import on a regular basis. The packaging must be properly labeled for importing. For example, for importing a food product into China the product must have labels that show and explain its features and properties (Reynolds, 1999). These regulations need to be a concern to packaging professionals, since they may be held responsible for noncompliance.

Conclusion

To better understand how to package a specific product for shipping within mainland China, many variables must be considered. The shipping equipment used in China will induce damage to a product if not previously considered. The distribution and handling environment is very different from that normally seen in the United States. A product could be dropped more frequently during this process in China so dropping needs to be accounted for when designing a package. Once the package is outside of the warehouse it is susceptible to many environmental conditions that are different from those in the United States. There may be some additional packaging components that will need to be added to the complete package to protect against these conditions. A packaging professional must also have an understanding of the Import Regulations, since they may be held responsible for the regulations on importing their product into China. If all these variables are not accounted for, a packaging engineer will experience high damage rates in China. He/she could cost their company large amounts of money.

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