Published in:
https://www.ebnonline.com/author.asp?section_id=3911&doc_id=283172

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Total Landed Cost Analysis: Identifying Hidden Costs in Global Supply Chains

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12/21/2017 Post a comment

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Competitive pricing is critical to any company's success, and OEMs are constantly seeking to cut the costs of producing products. Many companies focus heavily on reducing material, labor, and other production costs. An overlooked aspect of global manufacturing and distribution costs is a careful analysis of total landed cost (TLC).

TLC includes all costs incurred to produce a product and transport it from the manufacturing plant to the buyer. Key elements include materials and component pricing, labor, overhead, packaging, freight, import duty, customs clearance fees, taxes, insurance, inventory holding and currency conversion. The purpose of calculating total landed cost is to capture both obvious and hidden costs within the supply chain.

The analysis typically begins with what countries key components are sourced from and where the finished product is going to be sold. Add to this equation the benefits of producing manufactured goods in free trade zones and special economic zones that have their own sets of rules, in countries such as China and Malaysia, and analyzing these factors becomes extremely complex. Without country specific trade expertise, and an accurate picture of the entire supply chain, it is impossible to correctly compare true total landed costs for alternative manufacturing locations.

In large organizations, the responsibility for analyzing costs is often distributed between departments with different goals and incentives. Purchasing is responsible for suppliers and is focused on reducing product costs. Traffic or compliance groups are tasked with reducing transportation costs and customs fees. Materials or inventory planners are responsible for decreasing inventory. The true landed cost can only be understood when a comprehensive TLC analysis is completed. Many companies don't have the resources or expertise in this area, and turn to electronic manufacturing services (EMS) partners who have departments who do nothing but comprehensive TLC analysis and can identify hidden costs.

Defining product price & the hidden costs of supply chain re-design

Total product manufacturing cost includes the price of individual components used in the manufacture of the product, the cost of incoming freight and duty to deliver the components to the manufacturing plant as well as the price of direct labor to manufacture and test the product. It also includes the cost of overhead and indirect labor such as material planners, buyers, and manufacturing, quality, and test engineers.

The location of the manufacturing plant will impact the price of direct and indirect labor as well as the overhead. Lower cost locations such as Mexico or China will have lower labor rates.

However, the supply chain may need to be re-designed to ensure that the benefits of lower labor rates are not consumed by higher freight rates and inventory carrying costs. For example, if a supply chain has been designed using suppliers based in Europe and the product is going to be manufactured in China, the components will need to be shipped from Europe incurring freight charges, additional inventory funding costs and possibly import duties. Alternatively, the supply chain could be re-designed and the components sourced in China.

However, researching new suppliers, visiting them, managing a selection process and qualifying a chosen supplier is a time consuming and costly exercise. In the case of regulated industries such as medical, automotive and aerospace, the additional “hidden” cost to re-validate a new supply chain is significant (hundreds of thousands of dollars) and could be cost prohibitive.

Choosing a transportation mode: Air, rail or ocean?

When designing a supply chain, transportation of the end product is a critical element in evaluating TLC. Where the product is manufactured, the end customer destination, product size and weight are some of the elements that need to be considered when choosing a mode of transport. If the manufacturing facility and the destination are on the same land mass, road freight or train freight may be the most economic method. When the facility (or facilities) and destination are separated by water, sea or air freight are used.

Photo courtesy: Sanmina

For example, if a product is to be shipped from Shanghai, China to Central Germany, three choices are available: by rail, sea or air freight. Sea freight is typically the lowest cost option with six to seven weeks of transit time. Transporting by rail is around three times more expensive than sea but has half the transit time of four weeks. Air freight is about 10 times more expensive than sea freight but reduces shipping time to seven days. These guidelines are product and location dependent. Customer demand or a product launch may require the most expedient shipping method. Other factors in choosing which method to use include: quantity of products to be shipped, the dimensions of the packaged product and its weight.

Import duty

The starting point for calculating applicable import duties is to understand the Harmonization Tariff System (HTS) code. The HTS code is a ten-digit classification number that allows customs compliance requirements and import duty in the destination country to be identified. Since the “Information Technology Agreement” was signed by major trading countries, duty for many products is either zero or a single digit percentage of the product price, plus the freight costs in countries that signed up to the agreement. However, there are some HTS codes which attract double-digit import duty. For instance, selected TV equipment including some set-top boxes and video monitors face EU duties of 10.5% to 14%. Even if the percentage is small, it can lead to high dollar values when large volumes of products with lower unit costs are involved or when a product has a high unit cost. In addition some countries such as Brazil are not signatories to the Information Technology Agreement and have very high import duties.

Unforeseen costs

Unexpected events can cause both negative and positive challenges in a supply chain and impact TLC. On the positive side, an unplanned inside lead-time increase in demand is beneficial. On the other hand, if the supply chain is not pre-designed to be flexible enough to meet such an increase, significant additional and unforeseen costs may be incurred. If the chosen mode of freight from Asia to the U.S. is by sea, it may take over four to six weeks for goods to arrive. A short term upside could require air freight, which is significantly more expensive. Shipping a quantity of product in a 40-foot container by sea would cost around $4,600. Shipping the same product by air might cost as much as

$50,000 and would need to be packaged in smaller containers with additional handling and management costs.

Unplanned and mandatory engineering changes are sometimes required to fix a bug discovered in a product or to replace a component that has been recalled. These types of changes normally require immediate action on all products being manufactured. If product is shipped by sea, a pipeline of more than four to six weeks may need to be emptied, returned to the plant, unpacked, reworked and retested, which will cause additional costs. With four to six weeks of product on the sea, additional product must be manufactured within the lead-time to fill the gap in product supply. This increases the investment in inventory and will likely incur premium component costs and expedited shipping charges to get components inside the lead-time. When the new product is available, it will then be necessary to ship it by air to try and close the gap between demand and supply. Returning sea shipments to the plant will mean additional sea or air freight and inventory carrying costs. This type of unforeseen event might add hundreds of thousands of dollars of costs to the TLC.

Total Landed Costs Analysis Examples

A product's weight and dimensions are an important factor when calculating TLC. An OEM we worked with needed a large industrial automation product manufactured for sale in the U.S., The product weighed almost 400 pounds and when packed was 85" tall, 45" wide and 65" deep. Manufacturing in both Thailand and in Mexico was considered. Analysing the product's HTScode, it was established that import duty to the U.S. would be zero. As a result the decision was made to establish a significant portion of the supply chain in Asia. The table below shows the TLC calculation.

Origin	Product Price	Freight & Packaging Customs Clearance Merchandising Fee Harbour Fee	Freight Mode	Transit Time (Days)	Inventory Carrying Cost	Total Landed Cost	5000 Units Per year
Thailand	$ 21,536	$ 250	Sea Freight	45	$ 319	$ 22,105	$ 110,526,086
Mexico	$ 21,692	$ 219	Road Freight	3	$ 21	$ 21,932	$ 109,661,473
							$ 864,613

Product price is always a top consideration when deciding where to manufacture. If you focus only on product price, Thailand might be chosen as the preferred manufacturing location. For a less expensive product, say $150, the price difference based on manufacturing in Thailand or Mexico is not significant. The freight cost is developed by optimizing how many products can fit on a pallet, how many pallets can fit in a 40-foot container (by sea freight) or on a truck (for road freight) and calculating how many truck or container deliveries will be needed annually. Sea transport from Thailand in 40-foot containers can accommodate 40 units while road transport from Mexico can take four more units. The cost differential of freighting units from Thailand or Mexico is not notably different.

Another element of the equation to take into account is the volume of units and the possibility of longer freight times increasing inventory carrying time. Companies use Weighted Average Cost of Capital (WACC) to calculate the finance needed to support inventory. A tier one industrial OEM may have a WACC in the range 7 to 13%. Emerging companies may have a higher WACC. When the cost of carrying inventory for product in transit is added using a WACC of 12%, the TLC for product supply from Mexico is significantly better by over $800,000 with high volumes such as 5,000 units per year. If the product is to be sold for a number of years, the savings will be considerable. By

choosing Mexico as the manufacturing location, the transit time will be shorter and some of these unforeseen costs (e.g. palletting or container charges) can be minimized.

Other intangible factors

Having taken into account all manufacturing, freight, import duty and inventory carrying costs, less tangible factors also need to be considered. Time for personnel to travel to a location, the ability to communicate in the same language and in the same time zone, business continuity planning and market acceptance are some reasons why it may be necessary to decide to locate production in a specific location. In some countries the origin of manufacture determines whether a product will be purchased in that country. When a product is manufactured in very high volumes (tens of millions per year), it is important to develop robust risk management plans to ensure product supply will continue in the event that a natural disaster occurs. Choosing to manufacture products in two different geographies is one way to protect the supply chain against such a risk.

Design engineers may need to visit the production site, or be in regular communication with the manufacturing team. High levels of engineering changes, early prototyping, low yields and new technologies are some reasons why design engineers may need to interact with the manufacturing team more frequently. In these situations manufacturing products in closer proximity to the design team can be a significant advantage.

Products using multiple complex technologies require a comprehensive total landed cost analysis Including quantifiable and intangible factors. Image courtesy: Sanmina

An analysis of TLC is a complex task. In addition to product price, freight, import duty and other tangible costs, the costs of supply chain re-design, validation and the risk of unforeseen costs and intangible elements need to be considered. Choosing the correct manufacturing location can deliver significant product cost savings, failure to complete a comprehensive total landed cost analysis could cost millions.

Total Landed Cost Checklist

Quantifiable Cost Elements
Material
Direct Labor
Overhead
Freight
Import Duty & Taxes
Inventory Financing
Supplier Qualification
Validation

Intangibles
Product Maturity
Expected Product Lifetime
Number of ECOs
Market Acceptance of Manufacturing Location
Design Team Location
Yield Consistency
Specialized Skill Set