

1.221J Transportation Systems
Assignment 1: Transportation System Issues
Port of Long Beach, California

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Introduction

The Port of Long Beach (POLB) California is the world's third largest port, processing approximately 4.6 million cargo containers in 2003 (Port of Long Beach Fact Card 2004). The containers (also known as TEUs, 20 ft equivalent units), carry machinery, vehicles, agricultural products and other goods between Long Beach and overseas destinations. The port is an excellent example of an intermodal transportation system as containers are moved among boats, cranes, trucks and rails in one location. This paper will profile the Port of Long Beach as a transportation system by discussing general transportation concepts, important aspects of the system and potential areas for improvement.

General Transportation Concepts

The Port of Long Beach is the largest port in the United States. It receives incoming freight containers from primarily Asia and transfers the containers to trucks or trains for distribution to customers in the continental United States. Additionally, the port is an export location for US products going over seas to other countries and Hawaii. To execute these functions, the port has many physical components. To understand the port operations, it is particularly necessary to explore the infrastructure and vehicles in this transportation system.

The infrastructure of the port consists of "3240 acres of land with 10 piers and 80 berths" (Port of Long Beach Fact Card 2004). Each pier has multiple berths, where cargo ships dock to unload their freight containers. On the pier, there is storage space to hold containers before they are transferred to outgoing transportation. The pier also has roads for trucks to access the containers and logistics hubs where trucks and trains can be loaded with outgoing containers. The photo below shows a wide view of a pier at POLB including 1) docked ships with unloading cranes on the left, 2) container storage in the center and 3) outgoing trains on the right.



Port of Long Beach (Fearing 2002)

Many vehicles are involved in the daily POLB operations including ships, containers, cranes, trucks and railroad cars. For illustrative purposes, the import process will be tracked through all of these vehicles. Cargo ships from the Pacific Ocean travel into the San Pedro Bay and dock at piers at the POLB. The ships can be up to a quarter mile long (Port of Long Beach Fact Card 2004) and stack 20 ft. containers up to six units high on their decks. Although it is not required to containerize cargo, approximately 80% of US

imports and exports are processed through containers (Sussman 264). Upon a ship's arrival at a berth, the containers and other cargo are unloaded by cranes.



Ships, containers and cranes (Fearing 2002)

The cranes grasp the ends of each container and place the container on a truck. The truck transports the container within the pier's storage area. Containers are held on the pier until designated outbound transportation for the containers arrive at the pier.



Container Storage (Fearing 2002)

Before leaving the pier, containers must clear US Customs for security purposes. Due to the high volume, only a small portion of the containers are actually physically examined (I was unable to find actual statistics on this process), but paperwork is processed to record all import and export freight traffic. Containers are transferred via truck to their outbound truck or train for transport across the country.



Containers stacked double-high on outbound train (Fearing 2002)

Important Aspects of the System

In addition to the physical components of the port, there are other important aspects of this transportation system. Inspired by the United States Department of Transportation, the TRB Executive Committee and my personal experience, I would like to highlight five key aspects of the Port of Long Beach:

1. Efficient transitions between modes of transportation.
2. National security.
3. Labor relations.
4. Environmental impacts.
5. Innovation.

The port's main function is to efficiently transition freight between different modes of transportation or vehicles including ships, cranes, trucks and trains. Consider this aspect to be "mobility" (USDOT) or "global connectivity" (TRB Executive Committee). The port's operation is committed to moving freight to satisfy the needs of its customers: the suppliers, distributors and end-users of the cargo. To do this, the port needs to minimize congestion throughout the system and invest in additional resources to meet growing capacity demands.

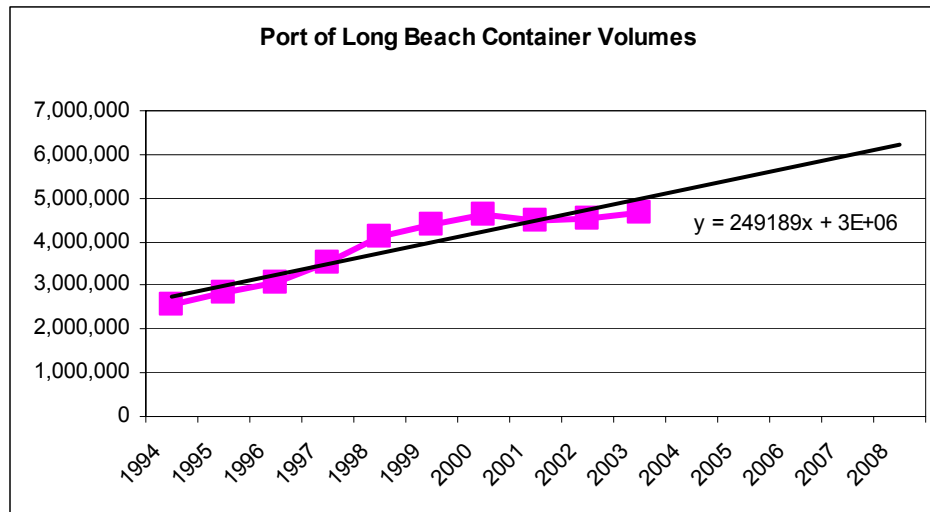
National security must be a major concern at the port. First, the port is a physical resource on which our economy depends and could be a target for terrorism. Maintaining a secure facility is imperative to the operation. According to the 2003 Financial Report (Port of Long Beach: Financial Report September 30, 2003), the port used federal funds "to enhance landside law enforcement patrols, to launch video surveillance systems, to monitor bridges and roadways and to cover other infrastructure security." Second, incoming freight must be evaluated to eliminate the risks of hazardous contraband. A twenty foot container can hold an enormous amount of questionable materials and products. Regulating the import of large volumes of materials must be a fundamental charter for US Customs at the POLB.

The Port of Long Beach is staffed by a dockworkers labor union with whom the port must maintain a healthy working relationship. In October 2002, the west coast dock workers' strike crippled 29 ports including Long Beach "costing the struggling US economy an estimated \$2 billion a day" (CNN Money). The strike resulted in a week's backlog of ships outside the port, a shortage of ships and empty containers in Asia and a spiral of negative effects to imports for Christmas sales. This illustrates "transportation as part of a broader system" (Sussman 62) with economic, social and political impacts. In the future, the port should proactively manage their relationship with the union, and address and negotiate issues as they arise to minimize the risk of another port lockout.

In addition to relying on a man-made pier, the Port of Long Beach utilizes the San Pedro Bay environment. The port has become a supportive citizen of the bay community by monitoring and regulating air and water emissions to minimize environmental impacts. Additionally, they have launched a "Healthy Harbor" campaign to track projects and

communicate successes. With the help of the environmental and freight communities, the port should continue to drive operational improvements to minimize their impact on the local ecosystem.

Innovation is required to improve system performance and expand capacity. For the past ten years, container volumes have been increasing by ~250,000 containers per year. To sustain this growth (as projected in the graph below), the port needs to plan for capacity expansion, so the overall transportation system does not become constrained. Innovation and improvement ideas are discussed further in the next section.



Source Data: www.POLB.com, “Container Trade in TEU Yearly Since 1994.”

Improvement Opportunities

The purpose of Port of Long Beach is to transfer cargo from ships to ground transportation and vice versa. This function not only supports the local Long Beach economy but also supports the success of businesses throughout the United States and other countries. To better serve its stakeholders, the port could make improvements to its current operation. Plans are already in place to invest in new infrastructure to accommodate increasing freight volumes; however these investments do not guarantee a more efficient operation. To that end, I propose the following investigations and improvements to increase efficiency and capacity at the port:

1. Identify process bottlenecks and increase their capacity.
2. Improve inventory management.

Both of these improvements will reduce cycle time and increase process capacity at the port. By identifying bottlenecks and alleviating their constraints, the port can increase its overall capacity. To alleviate constraints, they can implement load balancing between different functions or add resources such as labor, space, equipment or management

systems. For example, if outbound trucking capacity is a bottleneck, they could consider expanding their trucking hours beyond 7am-5pm.

Currently, container inventory is manually managed without a warehouse management IT system. Implementing a more automated system with RFID or GPS would allow port operators to 1) minimize ship time in port, 2) locate stored containers more quickly on the pier, 3) minimize container retrieval time to outbound transport and 4) minimize cycle time. Inventory management was a critical issue after the 2002 dockworkers strike as the port was flooded with containers and had no reliable way to process the inventory. Additionally, cycle time is especially important when dealing with agricultural products which may spoil if not processed quickly. A shorter cycle time in the port minimizes the overall transportation time to US customers.

However there are other potential effects of these improvements. In the short term, the labor union may perceive improvements as a risk to their jobs. Capital investments may be required for additional infrastructure, services or labor. Changing current operation may require downtime or general growing pains. However, in the long term these improvements can lead to a more competitive global port, faster transition between difference transportation modes and a higher volume of container flow per square foot of dock space.

Conclusion

The Port of Long Beach is an intermodal transportation system which processes high volumes of cargo vital to the United States' economy. The current operation utilizes pier infrastructure and a variety of vehicles to move approximately 12,000 freight containers per day. In addition to traditional operational requirements, the port must be mindful of a variety of issues including national security, labor relations, environmental impacts and potential innovations. By continuously evaluating their processes and taking appropriate action, the port will be able to accommodate increasing demand for freight transportation.

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