Towards an international intermodal network

Proposed alternatives to relieve port-rail bottlenecks at Los Angeles-Long Beach — and beyond.

The Southern California Association of Governments (SCAG) recently issued a regional transportation plan, which foresaw transportation gridlock caused by increasing volume and infrastructure investment shortfall. The situation is highlighted by the issues currently surrounding the Ports of Los Angeles and Long Beach (San Pedro ports.) In 1994, they envisioned 6 percent annual traffic growth, yet they actually experienced 12 percent. (See Figure No. 1) By 2020, volume is expected to triple (Figure No. 2, next page).

Combined, the San Pedro ports constitute the third-largest port in the world. Their growth is attributable to a number of favorable factors.

- The ports have deep draft and are open year-round.
- The Los Angeles Basin has a population and industrial base that generates sufficient local business for steamship lines. This tie is further strengthened by a regional commitment to international trade.
- There is more transcontinental rail capacity to San Pedro than to any other West Coast port. Until the consolidation of western railroads, San Pedro was served by three railroads — while other ports were served by only two. The combination of capacity and competition made San Pedro rail rates cheaper.
- The ports have been able to continually expand the supply of land available for terminal development. Over the past 10 years, their terminal size has grown — from 100 to 400 acres as vessel size and throughput increased — along with the need to accommodate on-dock rail.

Within several years, this abundance of land is expected to end. The challenge will be to accommodate continued trade growth within a constrained port terminal infrastructure. The current Hanjin facility provides a dynamic example of the problem. The 170-acre terminal opened in 1998 with on-dock capability. But volume growth was so great that this rail capability was never used and the space was used for vessel operations. Hanjin now plans to move into a new 375-acre facility in 2002. This facility also has plans for on-dock.

This article will attempt to examine the trade growth problem, with a specific focus on southern California. But the problems — and envisioned solutions — could apply elsewhere. (See Figure No. 3, next page. For example, Chicago now claims to the third-largest port in the world, as the North American railroad crossroad sees an estimated 11 million TEUs of international cargo move through it annually.)

On-Dock Rail. International containers using intermodal service have three movement options:

- Off-dock: A container, mounted on a chassis, is transferred by truck between the marine terminal and the railroad ramp.
- Near-dock: A container transferred (with or without a chassis) between a marine terminal and an adjacent, but external, rail loading facility.
- On-dock: Train loading within the same marine terminal as the vessel operation.

Double-stack transportation developed from the West Coast, where off-dock transfer had been normal practice. APL and SeaLand, the two industry pioneers, were reluctant to allow longshore labor access to intermodal cargo. In the early 1980s, the San Pedro ports built the Intermodal Container Transfer Facility (ICTF) off-dock, because studies showed on-dock to be unacceptable to shipping lines. The Southern Pacific was the only railroad who participated in building the ICTF — the Union Pacific and Santa Fe both felt they had sufficient terminal capacity to accommodate the envisioned trade growth.

On-dock rail evolved almost by accident. Tacoma started its operation to offset the high drayage cost to Seattle and the railroads’ apparent indifference to their port. In Long Beach, on-dock started to utilize rail infrastructure built for slab concrete business (which never materialized.)

On-dock eventually became more common. The lack of sufficient rail intermodal terminal capacity on the West Coast was a critical factor in accelerating this development. Ports used on-dock capability as a competitive tool. Today, almost every major marine facility has a proprietary on-dock facility included. The Alameda Corridor is a $2.4-billion commitment to on-dock rail. In fact, on-dock rail development in the San Pedro ports has come on line sooner than the corridor’s estimated completion in early 2002.

Intermodal Network. When double-
One popular solution is to load to a small group of destinations, which in turn, serve as rework points. For example, loads for Pittsburgh and Detroit might be initially loaded to Chicago, where they will be trucked across town to their eastern rail connection, while loads for Charleston and Jacksonville might be loaded to Atlanta and rehandled in an intra-terminal move. In fact, this does not solve southern California’s problem — it merely transfers it inland. Several railroads have attempted to load solid trains through to the East Coast. Here again we’ve only shifted the problem. The cross-town in Chicago has been eliminated — only to be replaced by an off-dock move in Los Angeles.

Possible Solutions. As international trade grows, new solutions will be necessary to accommodate the volume. One possible answer is the development of an international intermodal network with distinct attributes from the existing domestic network.

Leverage Logistics: A first step is to truly leverage logistics. Although international trade and logistics are intertwined, they do not always meet the same specific requirements. For example, consider JIT – just-in-time inventory. JIT arose in the early 1980s, when automobile manufacturers were suffering through economic recession and high interest rates. JIT did not greatly reduce the amount of inventory in the production pipeline. Rather, JIT allowed auto manufacturers to delay payment for inventory to when it was actually used. (This transferred the asset sheet...

Figure No. 2
Los Angeles-Long Beach container volume

Source: Alameda Corridor Transportation Authority.

Double-stack expansion gave rise to two factors which greatly complicated train loading:

1.) As the inland network evolved to common handling of international and domestic movement, the number of possible destinations increased, causing origin loading to become more difficult. In 1986, a steamship line might have been loading San Pedro discharge cargo to two or three destinations. In 2001, that same line might be loading to 25 different destinations.

2.) The loading challenge increased as the intermodal car fleet became more disparate. (See Figure No. 4, next page.) In 1981, the industry standard was an 89-foot flat car which could carry two units. In the subsequent 10 years, a range of car types (i.e., double-stack, spine, etc.) and configurations were introduced into service.

Outbound loading has become a giant jigsaw puzzle. The major goal was to optimize loading (i.e., utilize all available car slots while keeping common destinations “blocked”) without incurring expensive and time-consuming switching at origin. Railroad blocking rules (i.e., all spine cars at the front of a train regardless of destination) sometimes made the puzzle almost impossible to solve.

Major U.S. “ports” in 2000

Source: Alameda Corridor Transportation Authority.
inventory cost and risk to the supplier.) JIT may as well have been named JIC — just in case. Transportation shipments became a case of “hurry up and wait.” Inventory was positioned near the consumption point and many transportation carriers were required to hold inventory — often for extended durations — in their equipment.

Many steamship line executives face the delicate challenge of having to negotiate fast and reliable transit times at the same time they are being asked for extended freetime by shippers.

- Import cargo might sit for months, due to retail buyers seeking low-cost acquisition for seasonal items. As distribution centers fill, containers are treated like auxiliary warehouses.

- Export cargo can often sit longer, as sellers wait for buyers’ letters of credit to clear, or for a favorable time to sell traded commodities.

The equipment owner — along with marine and rail terminals — is called upon to absorb this slack.

The challenge is twofold.

1.) Collaborative logistical planning needs to assign — and update — expected movement. Logistical control systems are improving here, but they still need to unite the cargo information with the equipment. With such a union, import cargo would be scheduled for the time and place of devanning and export cargo would be scheduled for vessel sailing and destination.

2.) A system must be developed to allow cost-effective relocation of extended duration shipments to an off-site, low-cost intermediate point.

Make On-Dock Truly On-Dock. The current generation of marine terminals utilizes on-dock facilities designed much like they are near-dock. An import container is discharged from the vessel and comes to a point-of-rest (either on a chassis or in a stack) within the terminal. The intermodal operation is completely distinct from the vessel operation. The import is taken from its point of rest in the terminal and loaded to the rail car. The only difference between on-dock and near-dock is that the latter requires a gate move.

Ideally, on-dock involves a single move between vessel and rail. Initially, this could eliminate the intermediate point-of-rest, which may greatly accelerate terminal throughput and increase terminal capacity without requiring additional infrastructure. Current work rules are not the only obstacle to this change. Train loading often waits on vessel discharge to accumulate critical mass for specific destinations.

Railroads would like to see trains loaded in such a way that they can depart the port without needing extensive switching, and then be run as unit trains for an extended distance. This goal is tough to achieve because alliance vessels discharge cargo for different lines with different commercial priorities. Too often, “trains” are loaded on-dock at San Pedro, only to be switched at Los Angeles into existing trains. Operations are slowed and uncertainty contaminates operational planning. The uncertainty provides one reason for most on-dock facilities to keep capacity to store empty cars — and further consume scarce land. Hence, car turntime and operating expense increases.

In a perfect world, the rail operation would be adjacent to the quay and the vessel crane would handle a container directly to or from the rail car. The amount of space required for on-dock could thus be reduced by 60 to 90 percent. And the amount of space available in some terminals could increase by 15 to 40 percent. The resulting operation would be vastly more flexible and fluid.

Utilize Cheap — and Available — Real Estate. To load containers as described above, the container sorting process would be relocated from the on-dock marine terminal, and reworked. Today, intermodal terminals are located in population and industrial centers. They are often constrained from expansion due to lack of land or local approval. As previously described, some of these terminals already serve as rework terminals for cross-towns and beyond loading.

For San Pedro ports, a possible location for a rework terminal would be the Inland Empire, located about 100 miles inland. Both railroads’ transcontinental mail lines run through this area and land is more available there than in the Los Angeles Basin. Ideally, one facility could accommodate both railroads, although either railroad could decide to pursue the project individually.

The inland terminal would apply the logistics model to the containers. It would be an intermediate warehouse supporting time-definite delivery either to the customer (for imports) or to the vessel (for exports.)

The terminal would handle inbound trains for reloading to destination. Imports coming from San Pedro would have information about ultimate destination delivery requirements. An import would either be immediately reloaded, or stored there for subsequent loading. Loading would accommodate all intermodal destinations. Intact loading to connecting railroads would take place so that intermediate cross-towns and rehandles could be eliminated.

With numerous inbound trains from the port arriving, outbound trains could be scheduled to run more than once a day. The increased frequency would improve efficiency and service reliability. Scheduling algorithms would be developed so that containers could arrive at their destination terminal in sufficient time for delivery, but not so far ahead as to cause congestion. Service schedules would need to be defined and maintained to guarantee fulfillment of delivery appointments.

Export operations would be handled in a similar manner. Some lines may want to send cars directly to their on-dock facility, especially if they contain empties. However, all cargo destined for San Pedro ports would have the option of discharge at the rework terminal.

Outbound train movement to San Pedro would be driven by vessel sailing confirmation. Very often, exports are “rolled” to
subsequent vessels or destinations are changed. In marine terminals, this often requires multiple rehandling of stacked containers. Inland, they would remain on the ground until the marine terminal was ready to receive them. Rail service would also be available if containers needed to be diverted to other West Coast ports (e.g., Oakland, Portland, Tacoma, Seattle.)

Export movement to the marine terminal might not be as simple as import handling. It will likely be necessary for exports to be discharged and queued on the ground prior to vessel loading. But with proper terminal design, this could happen adjacent to the vessel, using the same quayside tracks.

Such a rework terminal would be designed to accommodate grounded storage of containers. Pricing of storage would be attractive to the steamship lines. Additionally, marine and rail terminals, no longer accommodating the traffic dwell, would realize significant operational improvement.

Expand the Intermodal Market. Once established for long-haul intermodal movement, an inland terminal could then be expanded in scope. When international trade began to grow in the 1980s, most cargo was consolidated in the Far East — especially in Hong Kong. Today, U.S. deconsolidation is increasing. It is estimated that San Pedro import cargo is evenly split between local consumption, intact intermodal and deconsolidation.

The deconsolidation traffic has some unique attributes. Much of this traffic is trucked to the facilities — many of which are in the Inland Empire — and then stripped from the marine box. Ultimately, much of this cargo leaves in domestic equipment. This cargo could move by rail from the marine terminal to the inland terminal for pickup. Exports and empty containers could be returned here for movement back to the San Pedro ports.

Obstacles. The congestion problems in San Pedro have built up over time. A proposal such as that advocated here would take time to gather supporters. Several issues merit review.

Network: There is concern that there might be insufficient network capacity (between the terminus of the Alameda Corridor and the location of such an inland terminal) to handle increased train frequency. But a southern California shortage of rail capacity appears inevitable as trade continues its incessant growth.

Financing: Public-private financing will need to increase to support intermodal solutions. This project would certainly be a candidate for such funding.

Labor: In addition to the infrastructure, an inland facility would probably encounter labor issues. Off-dock handling has been advocated by the ILWU as a congestion solution — and it is likely that they would want to “follow this work.”

Critical Mass: The on-dock infrastructure has evolved and been built up over the past 15-20 years. It cannot be replaced overnight. There is a network effect benefit of an inland facility — the more terminals connected to it, the more valuable it becomes.

Although it may seem a stretch, the development of an inland terminal supporting an international intermodal network might not be such a wild idea. There isn’t enough land at marine terminals to accommodate growth, nor enough money to continue to prop up a system that will encounter increased congestion. Incremental solutions to trade growth and intermodal demand can no longer be relied upon. A generation ago, double-stack radically transformed inland transportation. The industry needs another breakthrough to continue its growth.

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