Container Terminal Reservation Systems

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Abstract

The rapid growth in world container trade has strained the capacity of existing facilities, and made efficiency improvements in port terminals a priority. One means of improving terminal performance has been the introduction of container terminal reservation systems (Vehicle Booking Systems)[1] to manage the flow of work related to loading and unloading of containers from drayage trucks. Environmental issues, particularly concerns over air emissions of trucks idling in terminal queues, have also played a part in the introduction of reservation systems.

This paper examines the introduction of mandatory vehicle booking systems in Australia, the UK, Canada (Vancouver) and Southern California. While container terminals appear unequivocally to benefit from truck appointment systems, the impact on the drayage sector is not so clear. There are potential benefits which may arise from reduced queuing delays at terminals, and greater reliability in terminal turn times. However, there are also potential drawbacks including additional complexity of dispatch operations, inefficiency in fleet management, and financial impacts of booking fees and penalties charged by terminal operators. In addition, the rationing of access to the terminal confers market power on the terminal operator, and opens the possibility for strategic manipulation of the system on the part of both the terminal operator and the drayage sector to obtain commercial advantage.

Background

The most common reason cited for introduction of a Vehicle Booking System is the control of truck arrivals at the terminal to avoid congestion during peak periods. Clustering of truck arrivals typically occurs during specific days of the week, as a result of scheduling of vessel activity, and at specific hours of the day due to the restricted hours of operations of shippers and receivers of containerized cargo, generally daytime on weekdays (World Cargo News 2003). The rationale expressed by Hutchison Ports for introduction of a VBS at the port of Felixstowe is typical: “Over 4,000 HGV drivers visit the Port every day. Although the Port offers a 24-hour service, 40% of all arrivals at the terminals occur within a daily six-hour period. By ensuring that drivers pre-book their containers for collection/delivery within certain allocated time slots, VBS will enable a better spread of jobs throughout the working day, thereby enabling the Port to improve its service level to hauliers and plan its yard resource more efficiently.”(Hutchison Ports 1009 p.6.).

[1] In Australia and the UK, container terminal reservation systems are referred to as Vehicle Booking Systems. These terms will be used interchangeably in this paper.

Container terminal reservation systems offer a number of potential advantages to terminal operators, by eliminating peaks and improving the predictability of truck processing transactions. They can reduce the capital investment required for deployment of machinery to load and unload trucks by ensuring more effective utilization of the capital stock.(Acosta, 2009, p. 12). They can also ensure more efficient scheduling of longshore labor, the largest component of terminal variable costs.

The potential advantages of mandatory vehicle booking systems to terminal operations are analyzed in a recent Metrans study (Englert et al 2008). This study included development of a simulation model to analyze the impact of terminal operating parameters and truck arrival rates on the efficiency of truck handling operations within the terminal. Benefits included improved efficiency in the use of yard cranes, and reduced turn times for trucks resulting from prepositioning of containers for rapid loading. The results indicate that "Appointment systems allow terminals to reshuffle containers booked for the next day in a concentrated area to keep blocks to be serviced small. Even with the most rudimentary system of one-day advance appointments, terminals would be able to perform sufficient amount of reshuffling to enable more efficient deliveries." (Englert et al, p. 29).

The impact of Vehicle Booking Systems on the trucking industry has received less attention. The most significant potential benefit is a reduction in queuing delays and in-terminal turn times. Spreading activity more evenly throughout the day can also mitigate the impact of peak period congestion on the local road network, with additional potential advantages to the drayage sector resulting from lower travel times.

However, the additional complexity of operations can impose significant costs. Foremost among these is the possibility that "complying with terminal appointments tight time windows may not be met by trucking companies unless they increase the number of vehicles and personnel, which means additional cost and more vehicles on the road. Also, time windows may take away some of the scheduling flexibility that could be viewed as having a negative effect on customer service."(Chassiakos et al 2005 p. 14.) Specific features of Vehicle Booking Systems, including the number and duration of appointment slots, can have significant impacts on trucking productivity. A recent study by Erera and Namboothin concluded that the design of terminal reservation systems can be critical to maintaining the efficiency of trucking operations:

> *It is critical that terminal operators provide drayage firms with enough access capacity. Results show that vehicle productivity can be increased by 10 to 24 percent when total access capacity is increased by 30 percent…*
>
> *The duration of the appointment windows also may affect the ability of drayage firms to provide high levels of customer service. Test results indicate that up to 4 percent additional total capacity may be needed to maintain the same level of customer service if the slot duration is reduced by half.* (Erera and Namboothin, p. 25.)

The ability to coordinate container pick-up and drop-off within the same appointment window is also critical to maximizing trucking efficiency by balancing inbound and outbound loads.

Additional management and administration resources are also required to ensure that the trucking firm's bookings are managed in an efficient manner. This may include adoption of more sophisticated dispatch and trip planning systems.

> *Drayage firms must make good port appointment selections in order to maintain high levels of customer service; differences between the best and worst selections for a capacity distribution resulted in decreases in number of customers served by up to 4 percent for a fixed level of total access capacity.* (Erera and Namboothin, p. 25.)

The third major aspect of Vehicle Booking Systems is the potential for manipulation of the system by terminal operators and trucking firms. Timely access to port terminals to pick up and drop off containers is a precondition to drayage operators for viable commercial operations. This confers a substantial potential for exercise of market power on terminal operators by virtue of their control of the Vehicle Booking System. Similarly, drayage firms who are most adept at using the system can offer a higher level of customer service to shippers. In addition, the potential exists for firms to block rivals' access to the terminal through monopolization of appointments.

In summary, a successful terminal gate appointment system must be designed to simultaneously accommodate terminal efficiency, incentives for trucking industry compliance, and safeguards to prevent system manipulation.

Four examples of container terminal reservation systems are explored below.

Port Botany, Australia

Port Botany is located in Sydney Australia. Container traffic at the port totaled approximately 1.8 million TEU's for the 12 month period from July 2008 through June 2009. There are two major terminal operators with operations at Port Botany ports: DP World and Patrick. The DP World terminal was acquired from P&O Ports in 2006.

A Vehicle Booking System was introduced by P&O Ports in Melbourne in the mid-1990's. Patrick introduced a VBS at Port Botany in 1999 (Patrick Corporation 2007 p.22). Debate over the merits and impacts of the VBS has taken place in an overall environment of concern over the impact of the duopoly among terminal operators on all aspects of port operations. Ports in Australia are generally controlled by State governments, but port stevedoring is considered a "regulated industry" and has been subject to annual monitoring reports by the Australian Competition and Consumer Commission under Part VIIA of the Federal Trade Practices Act 1974 (Government of New South Wales, 2007).

Public scrutiny of the Vehicle Booking Systems at Port Botany has probably been more intense than any other location in the world. In February 2007 the New South Wales government requested the Independent Pricing and Regulatory Tribunal of NSW (IPART) to undertake a review of the interface between the road transport industry, rail operators and the stevedores at Port Botany under Section 9 of the Independent Pricing and Regulatory Tribunal Act 1992. The scope of the review included a full range of issues including the impacts on system efficiency, and the efficiency and fairness of charges imposed under the Vehicle Booking System. (Government of New South Wales, 2007 pp. 1-2).

The submissions and background papers submitted to the IPART review provide detailed information on operational aspects of the terminal VBS systems and on stakeholders concerns over the impact of the systems on their own costs and efficiency. The Patrick and DP World terminals operate individual VBS systems at Port Botany. Key features of the two systems are summarized below.

Port Botany Terminal Reservation Systems 2007		
Terminal	**DP World**	**Patrick**
Subscription Fee	A Carriers AUS$1334 per year; B Carriers AUS$29221.50 per year; AB Carriers AUS$667 per year	Not applicable
Booking fee	Not applicable	AUS$4
Slot allocation	Allocated among carriers, between A and B pools: A carriers max 2 per hour and B carriers max 4 per hour (exclusive)	Based on carrier 12 month history
Booking windows	A Carriers: 2 days in advance, exclusive allocation 0900-1030; B carriers 073-0820; the A and B carriers from respective pools; then all slots available	2 days in advance, 0700 and 0800, first come first served
Bulk stack runs (Speed gates)	Additional fee for A Carriers	Included in subscription fee
Consolidation moves	Not practised	
Demurrage free time	3 days	3 days, excl. Sundays and holidays
Demurrage daily charge*	AUS$66/TEU per day first 2 days; AUS$145 per day thereafter, reefer and hazardous goods charges extra	AUS$63.26/TEU per day first 2 days; AUS$154.68 thereafter; reefer and hazardous goods charges extra
Appointment windows	1 hour	1 hour
Grace period	20 minutes folllowing	2 hours following
Wrong zone (late) fee	AUS$55	Not applicable
No show fee	$AUS110	AUS$50
Double moves	Export tagging, time zone swapping (import/export)	
Advance information imports - Container number	Import container number changeable up to start of appointment	Required within 2 hours of booking
Advance information exports - container number	Not required	Required within 2 hours of booking
Transfer of appointments	Via cancellation and return to the pool (no show fee if not taken up)	Via cancellation and return to the pool (no show fee if not taken up)
*Demurrage charges effective 2009, GST included.		
Current Exchange Rate AUS$1=US$1.197		

Both systems are accessed through a common web portal provided by 1-Stop, a jointly owned subsidiary of the two companies which was formed in February 2003.(1-STOP Press Release). 1-Stop was operational at Port Botany by 2006.

Both DP World and Patrick stressed the importance of the Vehicle Booking Systems for maintaining high levels of terminal efficiency and maintaining acceptable turn times for trucks. DP World noted that their percentage of trucks processed within a 60 minute turn time (measured from in-gate to "truck complete" – truck loaded or unloaded) increased from 73% in 2005 to 85% in 2006. (DP World Port Botany, P. 13.) Patrick cited an average In Gate to Out Gate time of 51 minutes from January 2001 to June 2007, much less than was experienced in the early 1990's before introduction of the VBS.(Patrick Corporation, 2007). Both terminal operators also stressed the importance of financial penalties to ensure carrier compliance with the VBS.

Submissions to the IPART Review were received from a variety of organizations representing port stakeholders, including the Customs Brokers and Forwarders Council of Australia (CBFCA), Australian Trucking Association NSW, and the Container Logistics Action Group. These submissions identified a number of the stevedores' operating practices which negatively impact the efficiency of landside operations.

- Stakeholders expressed the perception that stevedores give priority to handling vessels to avoid penalties under their contracts with the shipping lines, to the detriment of efficient landside operations.
- The use of the Vehicle Booking System to force the port community to match operating hours with the terminals' 24/7 schedule places an undue cost burden on the trucking industry. This mismatch of operating hours extends to "empty container parks" (off-dock storage yards), which makes it difficult for truckers to "de-hire" empty containers.
- The submissions noted that the Port Botany terminals provide considerably fewer peak appointment slots than terminals at Melbourne, and that the lack of transparency in stevedores' daily slot allocations makes management of operations more difficult for trucking companies, shippers, and other supply chain stakeholders.
- The stevedores' turn times are not a true measure of terminal performance because they control access to the terminal at the In Gate – the terminal turn time does not include queuing delays which may be incurred when stevedores restrict access to the terminal to clear congestion.
- The fees charged for late arrival and no-shows are excessive and have become a major source of revenue for the stevedores.
- Stakeholders expressed concern that the stevedores were providing preferential access to their subsidiaries providing drayage and associated services.

The IPART Review made 18 recommendations for changes to improve efficiency. The most controversial

was a proposal for a two-tiered Vehicle Booking System with “guaranteed” slots allocated through an auction system, and other slots allocated by current methods. Under the IPART recommendation the stevedores would retain control of the number of appointment slots offered.

The proposed auction system was criticized by industry as too complicated, untested, and unpredictable, as well as potentially too expensive. The New South Wales government’s response was to instruct Sydney Ports Corporation (SPC) to take the initiative in a Port Botany Landside Improvement Strategy (PBLIS) to address the IPART recommendations in a two phase process.

> *Phase One will focus on improving transparency and providing industry with the opportunity to respond to the challenges and issues detailed in the report by developing, agreeing and implementing responses, including performance standards and peak pricing, with the assistance and leadership of Sydney Ports Corporation (SPC).*
>
> *If it is necessary to move to Phase Two, SPC will take control of the system and many of the performance standards will become mandatory.*(Government of New South Wales, 2008 p.5)

Issues related to truck movements at the port are being examined by the Port Botany Road Taskforce which includes representatives from SPC, DP World, Patrick Terminals, Australian Trucking Association NSW, Australian Container Freight Services, JJ Robertson & Sons Pty Ltd, and the Custom Brokers and Forwarders Council of Australia.

Two trials have been undertaken to assemble baseline data on collect operational data at Port Botany, with a view to validate and form a baseline for the agreed performance indicators. (Accenture, 2009). Data was collected for two 2 week periods in February and April 2009. The first trial collected data on 10 performance measures at the port terminals. The second collected data on a broader range of performance indicators and extended the analysis to empty container parks (off-dock storage yards). Over the course of the trials, the stevedores were encouraged to provide a minimum of 45 slots per hour. This was generally achieved by both stevedores on weekdays in both trials. Truck volumes were significantly higher in the second trial period, and average turn times higher.

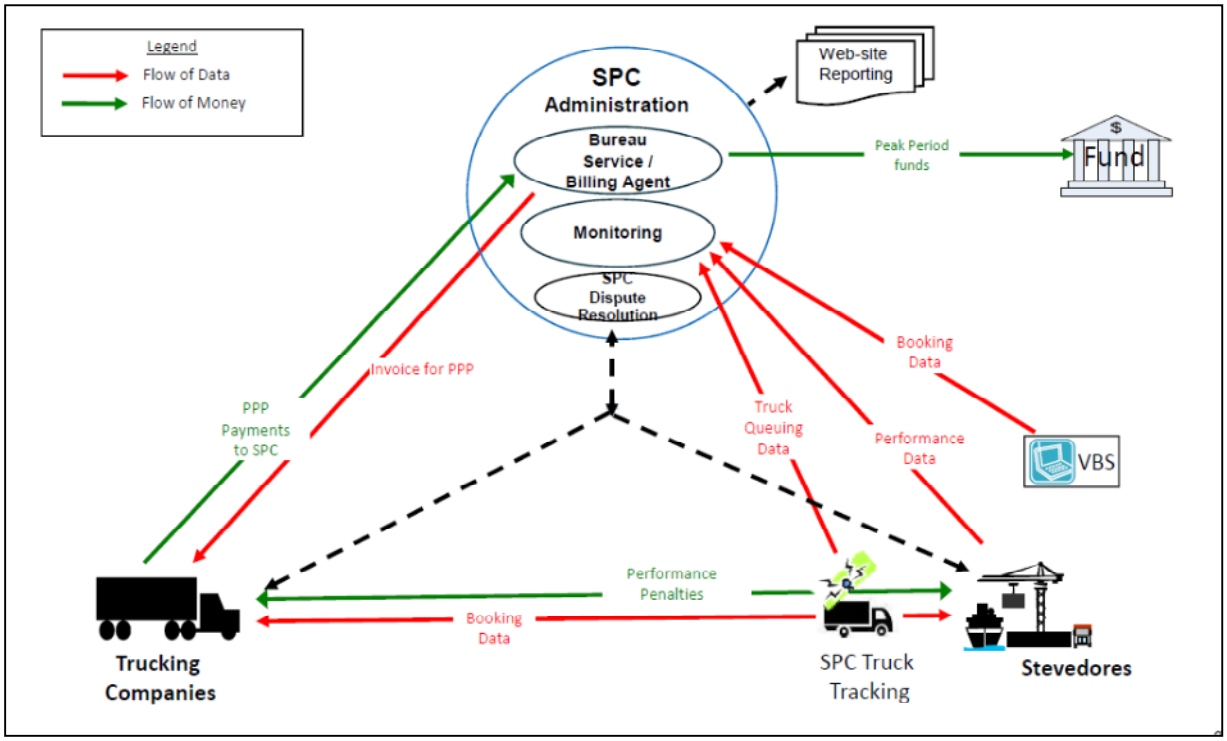
Port Botany Landside Improvement Strategy Trials 1 & 2		
	DP World	**Patrick**
Trial 1		
Total trucks	4891	5785
Average Turn Time (minutes)	40.7	45.4
Trial 2		
Total trucks	7462	8084
Average Turn Time (minutes)	52.4	52.5

In Trial 1, both stevedores managed to process 83-85% of trucks within the trial timeframe of one hour. In Trial 2, this declined to 73%-75% (Accenture, P. 7). Both terminals experienced very high utilization of the

available VBS slots in peak hours, particularly in Trial 2: “combined utilisation peaked from 02:00 to 19:00 weekdays (reached 90% or above), this included almost all of the peak and shoulder period.” (Accenture, P. 7)

Following these benchmarking trials, a two-pronged approach was proposed consisting of a set of Operational Performance Management standards with financial penalties for both trucking companies and terminal operators for non-compliance, and a peak period Pricing surcharge to provide incentives for expansion of operating hours across the supply chain. A schematic of the proposal is shown below.

Port Botany Landside Improvement Strategy Road Task Force Solution Overview



Source: Sydney Ports Corporation 2009.

Under this proposal, SPC would take a direct role in coordinating landside operations, as well as assessing financial penalties and distributing the revenues. Trucking companies would be responsible for timely arrival at the terminal and for ‘no-shows”, and would be assessed financial penalties (as they are under the late and no-show charges under the current VBS). However, terminal operators would be required to provide a guaranteed truck turn time (from entry of the queue to out-gate) of 50 or 60 minutes, with an allowance for an additional 15 minutes for each additional container transaction. Financial penalties collected for non-compliance would be distributed to the affected trucking companies by SPC. Data on truck turn times would be verified by electronic tracking (RFID or GPS) of trucks. SPC is planning

construction of an additional truck marshalling area to hold trucks prior to entering the terminal queue at the beginning of each hourly time zone (Sydney Port Corporation, 2009).

In addition, regulations requiring extended hours of operation by empty container parks, and requiring shipping lines to allow storage of their empties at multiple facilities, are being contemplated to improve the efficiency of the system.

Peak Period Pricing surcharges of AUS$160 per truck have been proposed for calls at the container terminals during peak hours (0500 to 1300), with a charge of AUS$80 from 1300 to 2100 and no charge from 2100 to 0500. A rebate of AUS$20 has been proposed for weekend calls. The charges have been structured on the basis of truck calls rather than container transactions to encourage more efficient use of trucks through two-way loading and multiple containers per truck.

Vancouver, British Columbia

There are four deepsea container terminals under the jurisdiction of Port Metro Vancouver[2] in British Columbia's Lower Mainland: Centerm and vanterm in the Inner Harbour, Deltaport on Roberts Bank approximately 40 km south of the inner Harbor, and Fraser Surrey Docks on the Fraser River. Container throughput at Port Metro Vancouver totaled 2.5 million TEU's in 2008.

In the summer of 2005 Lower Mainland drayage owner-operators withdrew their services to protest low trip rates and long waiting times at port and off-dock facilities. A Task Force was appointed by the federal and British Columbia governments to advise on port efficiencies and industrial relations. The Task Force made two recommendations relevant for this study:

Recommendation #7

> *The federal Minister of Transport should direct the Vancouver Port Authority and the Fraser River Port Authority to require that terminal gate operating hours be increased until trucking congestion is eliminated to the extent reasonably possible, and that both Port Authorities establish systems to continuously monitor truck delays, both inside and outside terminal gates.*

> *Recommendation #8*
> *The federal Minister of Transport should direct the Vancouver Port Authority and the Fraser River Port Authority to work with terminal operators, off-dock terminals, trucking companies, and owner-operators to evaluate and if appropriate implement a centralized, mandatory reservation system across all terminals at both ports.* (Federal-Provincial Task Force, 2005.)

[2] Port Metro Vancouver was created by the amalgamation of the three former Lower Mainland port authorities (Vancouver Port Authority, Fraser River Port Authority, and North Fraser Port Authority) on January 1, 2008.

Terminal operators were reluctant to operate extended gates due to increased labor costs. In November 2005 Vancouver Port Authority announced their Extended Gates Program which set a target to increase container truck gate operations at Vanterm, Centerm and Deltaport by an average of 20 per cent, per year, over the next five years. The three terminals each offered a single night gate beginning in January 2006, and in July 2006 they undertook a pilot project for additional night gates “as late as midnight” on Tuesdays. Off-dock terminals agreed to extend operating hours to 9 pm under the pilot program. In 2007 the terminals adopted “two-shift” operations, with Vanterm and Deltaport typically offering night gates to 2300 on Monday through Thursdays and Centerm on Mondays through Fridays. In addition, Saturday day gates were offered.

The recent downturn in TransPacific container volumes has resulted in significant changes to container logistics processes since last fall. Deltaport has experienced a surge in volume due to the transfer of existing services from Inner Harbour terminals. The consequence of this shift has been a reduction in volumes at the Inner Harbor terminals. Both Centerm and Vanterm have eliminated their night gates and are currently operating truck gates 0700 to 1600, though gates are closed from 1200 to 1230 at Vanterm to accommodate the longshore lunch break. Deltaport also discontinued night gates but reopened them in May in response to increased traffic volumes. Current Deltaport gate hours are 0700 to 1200, 1230 to 1600, and 1700 to 2300 Monday to Thursday, and 0700 to 1200 and 1230 to 1600 on Friday.

A web-based container reservation system was introduced at Port of Vancouver terminals in 2001 (Vancouver Port Authority, 2000). Initially reservations were compulsory only for picking up full import containers, and specific lanes at each of the terminals were dedicated to these transactions. Trucks without reservations were required to queue in non-reservation lanes. Trucks with reservations were required to arrive in line at least 15 minutes prior to the closing of the reservation window. If they were late, they were required to reschedule (import pickups) or queue in the non-reservation lanes (all other transactions). Reservations were made through individual terminal websites.

A mandatory reservation system was introduced by Centerm (P&O Ports at the time, now DP World Canada) in August 2005 and by Deltaport and Vanterm in the spring of 2006. (IBI Group, p.51). Port Metro Vancouver requires compliance with reservations systems as a licensing requirement for trucks serving the Port under federal regulations (Canada Gazette Part II). In April 2009 Port Metro Vancouver prevailed upon the terminals to standardize compliance requirements for the reservations systems. Appointment windows have been set at 2 hours (1 hour windows with half hour grace periods before and after), and reservations must be cancelled a minimum of 2 hours in advance (up from 1 hour).

Currently each of the four Port Metro Vancouver terminals has a different reservation system. The Deltaport reservation system is based on the WebAccess module of the Navis Terminal Operating System (TOS). TSI started using the NAVIS TOS at Deltaport on March 31, 2008.Reservations are transaction-based with separate appointments required for each transaction (import pickup, export

dropoff, empty pickup, empty dropoff). Companies can make reservations up to 10 days in advance for exports based on a shipping line booking number. Import reservations can be made following vessel arrival.

Deltaport does offer a larger number of appointments during peak periods to accommodate demand and to minimize queuing outside of the terminal. The table below shows the distribution of appointments at Deltaport for June 11, 2009. Appointment numbers and allocation are subject to change based on operational factors and terminal volume.

Deltaport Reservation System Appointments (June 11 2009)

TSI TERMINAL SYSTEMS INC. — Deltaport

ALLOWED	FULL IN	FULL OUT	EMPTY IN	EMPTY OUT	GRAND TOTAL
730	50	30	15	35	130
800	90	50	15	60	215
900	90	50	15	60	215
1000	90	50	15	60	215
1100	90	50	15	35	190
1230	47	20	5	25	97
1300	80	50	15	45	190
1400	70	40	15	50	175
1500	35	10	10	30	85
Total	**642**	**350**	**120**	**400**	**1512**
1700	75	30	15	40	160
1800	75	30	15	40	160
1900	75	30	15	15	135
2000	60	10	15	40	125
2100	55	30	15	35	135
2200	40	30	15	30	115
2300					
Total	**380**	**160**	**90**	**200**	**830**
Grand Total	**1022**	**510**	**210**	**600**	**2342**

Source: TSI Terminals

The Vanterm reservation system is similar to the original Vancouver Port Authority model in that there are two classes of appointments: one for import pickups, and one for all other transactions. Import bookings require firms to supply a container number, other bookings do not. Current daily appointments total 980, of which 280 are for imports.

Centerm's truck reservation system is based on an earlier version of Navis (installed 8 years ago) coupled with extensive in-house modifications. Reservations are mandatory for all transactions. Appointments can be booked a day in advance. In 2005 Centerm implemented a system called SCORE to allow shippers (transload operators, etc.) to book two days in advance. Centerm is working to improve the reservation system including developing an application to allow firms booking appointments to view the available time slots.

Fraser Surrey Docks has developed their own reservation system with the goal of ensuring flexibility for trucking firms. The system is based on gate appointments for trucks rather than specific transactions. This allows the carrier to have multiple transactions for each appointment. A pre-booking procedure to allow firms to book 2 days in advance has been implemented. This system is open to all firms. The normal process for booking reservations one day in advance applies. Trucks arriving at the gate are entitled to use the next available appointment for their company.

The port community has expressed concern over the impacts of the container reservation systems:

- The systems have substantially increased administration costs due to the additional workload of managing reservations. One large drayage firm contacted for this study indicated that staff devoted to dispatch has increased from one full time employee to three, and that dispatch responsibilities have become so stressful staff have to be rotated into different duties every few weeks.
- Drayage firms report that trucks are still subject to long and unpredictable delays at port terminals when volume is high. A study carried out for the Lower Mainland Container Logistics Stakeholder's Forum in 2007 concluded that "There is no evidence that the imposition of mandatory reservations has reduced overall turn times." (IBI Group 2007). Total turn times (from beginning of queue to out gate) measured at port terminals in the study averaged between 52 and 54 minutes at Vanterm, Centerm and Deltaport, but were significantly less at Fraser Surrey Docks (IBI Group 2007). However, variability in turn times was significant, with the standard deviation for the three major terminals between 38 and 40 minutes. The study also found that on average drivers spend 52% of their on-duty time waiting or being processed at terminals and warehouses.
- It can be difficult to obtain reservations because terminal reservations not linked to vessel reservation, and it is difficult to organize "double-header" trips due to the lack of linkage between import and export appointments in the transaction-based reservation systems, and different lead times for import and export appointments. (Lower Mainland Container Trucking Forum, 2009).
- Compliance with the appointment windows is difficult due to variability in travel times. A traffic incident on any of the major corridors can cause delays which impact operations throughout the day. Trucks may arrive too early for their appointments, before they are allowed to enter the terminal queue, and park on residential streets or on the side of the road to await their appointment window. Construction of an additional truck marshalling area in proximity to Deltaport has been proposed to deal with this issue.

Compliance with the reservation systems is typically in the neighborhood of 85% to 95%. However, this includes appointments which are cancelled prior to the 2 hour cutoff. The rate of appointment completion is significantly lower, generally in the neighborhood of 50% to 70%. Appointments returned to the system do not appear to be taken up by other firms, perhaps due to short notice between cancellation and the appointment window. There are no financial penalties for either late arrivals or no-shows.

Southampton UK

The Port of Southampton has a single container terminal, DP World Southampton (formerly Southampton Container Terminal). In 2007, DP World Southampton handled 1.9 million TEU's. The terminal is a joint venture owned 49% by Associated British Ports and 51% by the terminal operator, DP World.

The terminal suffered from yard congestion and high truck turn times due to rapid growth in traffic volumes from 2001 to 2004. Peaking of truck arrivals was a major contributor to poor turnaround times at the terminal. A voluntary Vehicle Booking System implemented in 2003 failed to resolve the problem. In 2005 SCT implemented their mandatory Simplified Vehicle Booking System which was successful in reducing average turn time and improving reliability (Discover Southampton 2006).

The Southampton VBS was developed following five months of consultations with the trucking industry and shipping lines. For the trucking industry, compliance with the terminal VBS was made more difficult by the fact that they typically face delivery windows ranging from 30 minutes to 3 hours at inland Distribution Centres (Department for Transport 2008). Consequently maintaining flexibility was a prime concern.

Initially the Southampton VBS allowed three types of bookings: provisional, regular and guaranteed. Guaranteed and provisional bookings have been eliminated in the current version of the VBS. All bookings now require a container number. Truckers are limited to a maximum of 10% of total appointments within each hourly slot (DP World Southampton 2009). Unneeded appointments may be returned to an exchange where they can be taken up by other carriers. Bookings for slots within peak hours cost £1, bookings for off-peak hours are free. Peak hours are 04:00 to 06:00 and 14:00 to 18:00 Monday to Friday. Landside Operations are open from 19:00 on Sunday to 18:00 on Saturday. A no-show fee of £25 is charged for cancelled bookings or bookings which are returned to the exchange and not taken up by other carriers. Under normal conditions the system allocates 120 appointments per hour, though this may be increased if additional resources are available at the terminal.

The system has a number of features which increase the flexibility of bookings for carriers:

- The details of a booking can be amended as many times as required free of charge.
- A booking can be moved within a tethered window, up to six hours before or after the original booking, as long as there is a booking available and the trucking company does not exceed the hourly allowance.
- Bookings can be made any time prior to the end of the booking window if there are bookings available.
- Carriers can book an appointment for a single container and add other containers to that appointment. They can also remove containers from an appointment.
- The system allows drivers to amend appointments by cell phone or text messages as required. There

is a commercial truck stop in the vicinity where drivers can park to await their appointment window.

There were several changes made to terminal operations in order to facilitate more consistent service times for trucks. A 24 hour telephone Helpdesk was implemented. The terminal layout was realigned to create three separate transfer areas for trucks, accessed through a single pre-gate. Trucks are assigned to a transfer area at the pre-gate based on the location where the truck will be loaded or unloaded. If transfer areas are full, trucks are required to queue in specific areas in the pre-gate area. Approximately 50% of truck movements bypass the pre-gate through agreements between the terminal operator and carriers regarding seal inspections, etc. which allow them to drive directly to the appropriate transfer area. This arrangement is not applicable to exports to the U.S. due to security requirements.

The terminal also has an expanded area for storage of empty containers. Trucks calling solely to drop off empty containers are assigned to a special lane at the pre-gate. The VBS allows an additional 25 empties-only slots per hour in addition to the usual 120 hourly slots.(Portstrategy Online 2008).

The Southampton VBS appears to have been successful at reducing turn times at the terminal. The terminal operator reported that in May 2006 the terminal achieved an In-Gate to out-gate turn time of less than 40 minutes in spite of record truck volumes of 1152 vehicles in a 12 hour period. On average, each truck handled 1.7 containers (SCT Emonthly 2006).

However, the reported turn times do not include delays resulting from truckers waiting for their appointment windows off-site or queuing delays outside the pre-gate. A recent report from the UK Department for Transport suggests that total turn times can be significantly longer:

> *With the introduction of the Vehicle Booking System (VBS) it is feasible for a lorry to spend just 35-45 minutes within the port gates, but this doesn't include waiting outside the port gates for the three conditions to be met. Stakeholders report that the average time to collect a container, including waiting outside the port, is 1.5 hours. Consequently, hauliers generally allow 1 – 1.5 hours in their planning for the delivery and collection of a container at any of the major ports (depending on time of day).* (Department for Transport 2008).

The Southampton VBS appears to have been reasonably well accepted by the port community. Two concerns over the impacts of VBS systems have been voiced by the UK Freight Transport Association in comments regarding introduction of a new VBS at the port of Felixstowe:

> *Whilst [the schemes] can reduce waiting times at ports they are still a significant cash cost to users as there is a £21 no-show fee every time a haulier misses a slot, with no corresponding recompense from the port if it fails to deliver on its promises on turnaround times…*

> *In addition they add a significant burden to the costs to business due to the expense of administering the scheme (Freight Transport Association 2007).*

The Freight Transportation also urged the removal of the peak booking fee at Southampton. In general, the FTA is opposed to additional charges imposed by terminal operators on landside users rather than the shipping lines.

Los Angeles/Long Beach

The impact of terminal gate appointment systems at the ports of Los Angeles and Long Beach was extensively analyzed in Dell'Aquila, Giuliano, Hayden and O'Brien.Adoption of terminal gate appointments in California was spurred by passage of Assembly Bill (AB) 2650 in 2002. The legislation imposed a penalty of $250 on marine terminal operators for each truck idling more than 30 minutes while waiting to enter a terminal gate at either the Port of Los Angeles, Long Beach or Oakland. Terminals could avoid fines by extending gate hours to 70 per week (65 hours at the Port of Oakland), i.e. adding full service evening or weekend gates designed to spread out truck traffic, or by offering a gate appointment system to trucks to drop off or pick-up cargo containers.(Dell'Aquila et al, p. 17.) Most terminals responded by offering voluntary reservation systems either through the third party service provider e-Modal or through terminal proprietary systems (MTC Voyager or Navis).

Terminal operators' enthusiasm for the appointment systems varied. Many saw little opportunity for improvements to terminal operations, and potential liability for prosecution under AB2650 was a disincentive for increased use of appointments. Terminal operators who saw the systems as a means of improving terminal performance responded by encouraging trucking firms to make appointments and providing improved service levels. However, use of the appointment systems was relatively low, ranging from 5% to 30% of total gate moves. .(Dell'Aquila et al, 2008 p. 31.)

A survey of trucking firms produced the following results:

> *Respondents were asked what percentage of total transactions was made by appointments. The average is 42 percent; the range is 1 to 90 percent. Appointments are used selectively. First, they are used primarily for pick-up of import containers; all of those who use the appointment system use it for import pick-ups. About 1/3 also use appointments for export drop off, and pick-up and drop off of empty containers. Second, they are generally made for a particular time of day and for certain terminals (Table 6). Frequencies are given in numbers. Appointments are scheduled either 24 hours in advance or on the same day; few firms schedule more than 24 hours in advance.* (Dell'Aquila et al, 2008 p. 35.)

None of the respondents to the trucking survey unequivocally indicated that the system had reduced turn times at the terminals.

Subsequently, all of the Southern California terminals implemented extended gate operations through the OffPeak program which imposes surcharges on peak hour movements (0300 to 1759 Monday through Friday). OffPeak is administered by PierPASS, a non-profit organization of the terminal operators operating under antitrust immunity granted by the Federal Maritime Commission. OffPeak has been successful in mitigating peaking problems at the port terminals by shifting traffic to non-peak hours. Data released by PierPASS in July 2008 indicated that 40 percent of all container moves at the two ports took place on days with both peak and OffPeak shifts (PierPASS, 2008).

The implementation of PierPASS removed the incentive of AB 2650 for implementation of terminal appointment systems. However, terminal operators who embraced appointment systems as a means of improving terminal performance have continued to move forward with implementation.

Foremost among these is Total Terminals International (TTI) at the Port of Long Beach, which is currently the only terminal at the Ports of Los Angeles and Long Beach with a mandatory reservation system. TTI uses the proprietary VoyagerTrack reservation system.

The reservation system at TTI Long Beach has been refined over a 5 year period. The system was initially introduced to mitigate peaking of truck arrivals early in the day, which resulted in long turn times and queuing which affected the public road network. The implementation of PierPASS shifted arrivals to off-peak hours but peaking was still a problem at the start of the off-peak gates at 1800. Mandatory appointments were implemented for import pickups by April 2007(Longbotham, 2007) and for export drop-offs on September 2, 2008 (TTI, 2008). Currently chassis movements are the only transactions which do not require appointments, though this may change in the near future.

The VoyagerTrack reservation system allows appointments to be made via telephone or on-line 24 hours per day. TTI recommends that trucking firms make bookings 48 hours in advance and then cancel and rebook if necessary. There are no financial penalties for late arrival or no-shows, and no booking fees. Appointment windows are 1 hour with grace periods of 30 minutes before and from 30 minutes to 180 minutes after the hour. The terminal operator reports that in-terminal turn times average less than 30 minutes and queuing delays are insignificant.

The system in use at TTI Long Beach also provides significant improvements to the efficiency of terminal operations. It dynamically reallocates activity among terminal blocks at half hour intervals to improve utilization of container handling equipment. The terminal operator indicates that this, combined with an alternative sequencing algorithm for transtainer operations, has resulted in a 3 fold increase in transtainer capacity per hour. Based on this result, the appointment system has allowed the terminal operator to simultaneously reduce labor costs, improve equipment utilization, and reduce truck turn times.

Conclusions

- While theoretically terminal appointment systems can provide joint benefits to both terminal operators and trucking firms, the predominant reason for their adoption is the avoidance of peaking of truck arrivals at the terminal gates. This is typically a consideration in both the private sphere (terminal operators and trucking companies) and the public, due to the impacts of port traffic on regional traffic volumes.
- Reservation systems and peak period surcharges (such as OffPeak) appear to be competing solutions to peaking of truck movements. Both provide opportunities to transfer activity to off-peak periods, but the use of reservation systems arguably imposes a larger burden on the trucking industry as opposed to the broader port community. However, the experience of OffPeak in Los Angeles/Long Beach appears to indicate that peak period surcharges have minimal impact on truck turn times.
- Trucking industry acceptance of appointment systems appears to be dependent on significant reductions in total turn times and improvements in the reliability of truck processing at the terminals. It appears that turn times and reliability have improved at Southampton and TTI in Long Beach, while evidence is scant for any improvement at Sydney and Vancouver as a result of appointment systems.
- In the balance between tighter scheduling or more flexibility, the trucking industry favors flexibility while terminal operators tend to favor “discipline”. Acceptance by the port community of Southampton’s Vehicle Booking System appears to be at least partly due to its flexibility in accommodating uncertainties in truckers schedules.
- The imposition of financial penalties for late arrivals and no-shows by terminal operators is often viewed as one-sided, and pressure exists for reciprocal performance requirements which would require terminal operators to compensate truckers for long turn times. This has been proposed for implementation for Sydney, and suggested by the Freight Transport Association in the UK.
- Attempts to more tightly schedule drayage activities appear to require increased investment in truck staging areas. In both Sydney and Vancouver port authorities are under pressure to construct additional staging areas, while Southampton has the advantage of a commercial truck stop to provide additional capacity.
- Public regulation of terminal operators is often required to motivate changes in behaviour among the port community.

One striking feature of the debate over container reservations systems is that the focus has been limited to the relationship between terminal operators and the trucking industry, apparently under the presumption that shipping lines are indifferent to issues of landside performance. While vessel handling performance is clearly the key concern for shipping lines, they may be affected by container terminal reservation systems directly to the degree they integrate inland transport into their service offerings, and their ability to attract cargo may be dependent on shippers’ ability to move their cargo on and off of the dock in a timely and efficient manner. It may be interesting to compare practices at shipping lines’

dedicated terminals to those at common user terminals to assess whether there is any difference in the focus on customer service.

Container terminal reservation systems also appear to be a fertile field for further research, including the actual cost impacts of container terminal reservation systems to the trucking industry, potential means of mitigating these costs through improved dispatch processes, and for a game theoretic approach to analyze the impact of system parameters on compliance among the port community.

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