Georgia Ports Authority

Leading US container port deploys RFID technology to support productivity, safety and sustainable growth for the coming decades

IN THE COMPETITIVE WORLD OF MARINE CONTAINER TERMINAL OPERATIONS, THE GEORGIA PORTS AUTHORITY STANDS OUT AS ONE OF THE INDUSTRY'S TRUE SUCCESS STORIES. SINCE THE LATE 1990S, THE US EAST COAST PORT HAS GROWN ITS CONTAINER HANDLING OPERATIONS BY MORE THAN 230%, TRANSFORMING ITS GARDEN CITY TERMINAL IN SAVANNAH INTO THE FOURTH LARGEST CONTAINER PORT IN THE USA.

Handling more than 2.6 million TEU in 2008, and with a market share of over 7%, today Georgia Ports Authority (GPA) trails only the giant complexes of Los Angeles and Long Beach on the West Coast and New York/New Jersey in the North East.

A very clear management vision, backed by robust planning and execution, has seen the port reinforce its position as the prime export gateway for Georgia's shippers, while also carving out a new role as a major East Coast hub for containerized imports from Asia and other key markets.

Forecasting a long-term trend for US retailers to diversify their shipping routes, rather than rely purely on transpacific services through West Coast ports, GPA has capitalised on its natural assets – deep water, proximity to major inland consumer markets, good road and rail connections, and plenty of available land – to develop a shipper-friendly import gateway.

The creation of a cluster of high-volume distribution centres (DCs) around the port has been an integral part of the GPA success story. Home to household names such as Wal-Mart, Kmart/Sears, Dollar Tree, IKEA, Pier I Imports and The Home Depot, this DC infrastructure has proved instrumental in increasing container volumes and shipping services through GCT.

The terminal now boasts 22 all-water Asian services, transiting both the Panama and Suez Canals, and has an enviably well-balanced 53% export to 47% import TEU. Even in the face of global economic downturn, GPA was able to attract 12 new and reconfigured container shipping services in FY2009 (July 08-June 09) and achieved its second highest ever throughput, at just over 2.4 million TEU for the fiscal year.

THE CHALLENGE

With an eye to the 2015 opening of the expanded Panama Canal, and a determination to stay ahead of the curve, GPA's overarching vision since the early 2000s has been to increase annual capacity to 6.5 million TEU by 2020 without increasing the size of GCT.

At over 1400 acres, GCT is the single largest marine container facility in North America. Even so, boosting capacity to 6.5 million TEU while improving service and safety and reducing environmental impact is a major undertaking.

"Our entire focus over recent years has been how to put in place the people, processes and technologies to support the future growth that we see," says Bill Sutton, Director Information Technology at GPA. "It's all about how we plan infrastructure, equipment, layouts and systems to move as much cargo as we can, in the most efficient and cost-effective way that we can."

It was back in 2000 that GPA first kicked off a project to research cutting edge gate, equipment and container tracking systems deployed at container terminals around the world.

"We visited world class leaders in production and volume to evaluate best-in-breed technologies and vendors, and assess what we could leverage in our business and labor environment," says Sutton. "For us, it's all about putting systems in place that will allow our people to process more containers per day, reliably and efficiently, and ensure that our equipment is operating at the highest productivity."

ACTIVE RFID AS A KEY ENABLER

Finding a data capture technology that would reliably identify trucks in the harsh marine environment was a key aspect of GPA's R&D mission, says Sutton. Especially, GPA needed a way to "marry" containers and trucks in its management system, i.e. to track which inbound and outbound boxes were paired with which street trucks as they entered, transited and exited the terminal.

A high percentage of containers arrive and depart GCT by truck, including many short-haul, time-sensitive moves. Around 45% of import boxes are destined for one of the 20+ local Savannah DCs. Truck drivers may visit the terminal several times a day and need to be in and out as quickly as possible to meet shipper schedules. So planning for the future meant handling an increasing volume of trucks without compromising service levels.

"Our major performance metric is daily truck gate moves. This is the pulse of our operation and we look at those numbers every day. We simply could not have long lines of trucks sitting outside the terminal or slow to transit once inside," explains Sutton. "So it was especially important for new technology to help us improve truck gate throughput, reduce turn time in the yard and gain a highly accurate overall inventory of our truck traffic."

License plate recognition software was considered, but discounted due to lack of consistency in license plate position and misreads due to dirty or damaged plates. Instead, radio frequency identification (RFID) technology won the day for its ability to uniquely identify assets in the most challenging conditions. This includes the US rail industry, where the use of RFID tags to track tens of thousands of railcars running across the network has been mandatory since 1991.

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The objectives:

- Increase truck gate throughput, capacity and service levels

- Reduce overall truck turn time through the terminal for enhanced productivity and customer service

- Gain a highly accurate inventory of truck traffic and terminal equipment

- Improve the speed and accuracy of data acquisition and processing

"We knew that if RFID had proved itself over time in demanding rail conditions, it could certainly hold its own in marine terminals," says Sutton. GPA was also interested in the ability to encode active RFID tags with data above and beyond a basic ID number, including truck weight and other key information.

THE ROAD TO DEPLOYMENT

Following extensive research, GPA honed the vision for its Automated Terminal Asset Management System (ATAMS), covering four new technologies to capture key data capture and manage business processes, plus middleware to integrate data into central terminal management applications:

- Optical character recognition (OCR) to identify containers and chassis passing through the gates
- A position detection system (PDS) to locate containers and equipment in the yard
- RFID to track trucks moving through the gates and around the terminal
- A wireless local area network for data transmission

In early 2005, GPA issued an RFP for the different technologies and middleware. For the RFID component, IDENTEC SOLUTIONS was selected to supply its active, long-range, low-power ILR® wireless tags and readers, together with the i-Mark® sensor solution for precision location detection.

Having gained first-hand experience on a previous pilot project, GPA knew that it wanted the capabilities of battery-powered, long-range active RFID tags, versus cheaper, short range passive tags. But the chosen system still needed to be as cost-effective as possible. "What we wanted was to gain targeted visibility into street truck and yard vehicle activity at the key hand-off points in our process," explains Sutton. "The technology from IDENTEC SOLUTIONS ticked all the right boxes on cost and capabilities."

THE SOLUTION
IDENTEC SOLUTIONS devised a cost-effective, low-infrastructure RFID solution to provide real-time visibility into truck inventory and enable data capture at the required hand-off points:

- Inbound and outbound gate moves for street trucks
- Container transfer between yard cranes and street trucks
- Container transfer between vehicles and mobile container handling equipment (CHEs)

Installed during 2008, the system comprises three main components:

- Active 915 Mhz 'read-write' RFID tags, encoded with a unique ID number, fitted to truck cab rear bumpers
- Intelligent RFID interrogators with 300ft read radius at the gates, in the yard and on CHEs, to scan and capture data from the truck tags
- iMark® position markers in gate lanes and on RTG crane legs to provide precise location data for each tagged truck

The i-Mark® technology is a central feature. Designed to determine the exact location of tags without the need for expensive real time locating solution (RTLS)

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infrastructure, i-Mark® uniquely allows users to pinpoint tag location down to an individual lane and also recognizes the direction in which the tag – and therefore the vehicle – is moving.

The system involves the use of a buried 125 Mhz inductive loop, connected with maintenance-free position markers mounted near the loop. As the tag passes the loop, the position marker is triggered and transmits a unique data string into the tag, identifying the precise time, location and direction of travel. That information, plus the tag ID, is then forwarded to the RFID readers, which relay the data via middleware into the TOS. Here, it is 'married' with container information to provide an absolute record of the truck-box combination.

GATE OPERATIONS
With 33 truck lanes operating across two main gates, plus a third Rapid Dispatch gate, the gate operation was certainly the most critical piece of the GPA challenge.

Laden street trucks entering GCT pass through a series of checkpoints in the gate process. First is pre-gate, where truck and driver identity and authorization are verified. The truck then moves to the main gate, where truck number and container number are recorded and the driver is issued with a job ticket. The truck passes over a weigh scale and onto 'the canopy', a covered inspection area, where the container is checked for damage and tampering before final instructions are printed and the driver is cleared to enter the yard.

To ensure optimal traffic flow, drivers can freely change lanes as they move through the checkpoints. GPA did not want to sacrifice this flexibility. By installing position markers at the key checkpoints in every lane, IDENTEC SOLUTIONS was able to automate this highly asynchronous gate flow. Now, i-Mark literally allows GPA to 'see' each truck as it moves from lane to lane and to record the course of its journey.

GATE BENEFITS

Combined with OCR for container ID, the introduction of RFID has enabled GPA to move staff away from the

Once tags are fixed, truckers access the web portal to enter their tag ID numbers and associate these with all of their truck ID numbers. This provides a permanent, unique record for each truck, which is used along with bill of lading or container number to pre-advise individual gate moves.

The automated system has reduced trouble transactions at the GPA gates from around 10% of truck calls down

direct gate area, alleviate the administrative burden of manual data processing and allow trucks to move faster through the system. RFID technology also supports GPA's web access system, a related efficiency measure introduced by the port for trucking companies to pre-advise container pick-ups and drop-offs before arriving at the terminal.

With "local repeaters" making up most of GPA's trucking community around 97% of gate moves are now pre-advised via the web, explains Gate Manager Eddie Johnson. RFID is crucial to the process. GPA has so far supplied over 11,000 tags free of charge to trucking companies, including a 6-week kick-off program in 2008 when GPA staff educated truckers about the new technology and helped them fit the tags. Tags and training are now supplied on a rolling basis.

to less than 3%. This has had an important impact on productivity, explains Johnson, as trouble transactions are typically time-consuming and staff-intensive to resolve.

Other key gains include the elimination of truck queues outside the terminal gates, which previously could reach 30 minutes, with productivity benefits both for the port and truckers, reduced highway congestion and less pollution from idling trucks. At the gate itself, says Johnson, the RFID system has cut time from every stage of the process, including a saving of 1 minute per transaction under the canopy alone.

With some 7,500 gate transactions and more than 2,000 unique trucks moving in and out of GCT every day, the minutes definitely add up. As growth resumes

Intelligence to go

GPA's mobile RFID reader has proved a valuable
tool for measuring actual performance against metrics

Developed by Bill Sutton and his team at GPA, the innovative system
includes an RFID reader from IDENTEC SOLUTIONS, mounted on a
small 2-wheeled trailer and fitted with solar panels to provide energy
to the reader. The mobile unit is simply hooked up to a vehicle and
dropped off at any spot in or outside the facility where GPA wants to
conduct a time trial.

As tagged trucks pass by the unit, the time and tag ID are recorded. The management team can then measure
this against the moment when the trucks pass a nominated fixed reader in the yard or at the gate, providing
solid data on point-to-point transit times. "The mobile reader allows us to conduct time studies anywhere we
want," explains Sutton, "so we can really see how long it is taking to move boxes through any section of the
terminal." The GPA team has also taken the unit out on the road, on one occasion using the device to prove that
a complaint from a local company about delays at the terminal was actually unfounded – the problem lay before
the trucks arrived at the facility.

after the downturn, daily gate transactions are expected
to hit the 11,000 mark in the coming 3-5 years. GPA is
confident that its RFID investment will help it to handle
steadily increasing gate volumes in a timely and
efficient way.

YARD OPERATIONS

Once empty and laden street trucks enter the yard, the
RFID system helps manage the container hand-off
process between trucks and yard cranes. GPA operates
a fleet of over 70 RTGs, each of which has been fitted
with i-Mark position detectors on the crane legs.

As trucks pull up alongside the crane, the position
markers send time and location data to the tag, which
is then scanned by a nearby reader. Tag ID and
location data is sent
from the reader into
the middleware and
onto the TOS, where
it is associated with
the correct container
number.

Instructions for the
job in hand – either
offloading a box from
the truck into the
stack or retrieving a
box to load onto the
truck – are then sent

to the data terminal in the RTG operator's cab, where
they are automatically 'promoted' to the top of the job
list. As containers are stored in the stack, their final
location is updated in the PDS system for later use.

GPA has also used the technology to streamline hand-
off between CHEs and trucks, including both street
trucks and tagged internal yard vehicles. Container lift
trucks are fitted with RFID interrogators that read
vehicle tags when boxes are loaded and offloaded and
send the identification data to the terminal system.

YARD BENEFITS

As with the gate, use of RFID in the yard has helped
GPA to improve operational safety and productivity and
provided real-time intelligence on truck and container
inventory location.
Previously, staff on the
ground would relay
container stacking
instructions via radio to
the RTG operator. That
task is now managed by
the system, removing
personnel from
underneath cranes.

Working conditions and
efficiencies for the RTG
operators are also
improved. They no

longer have to look down at containers some 70-80ft below to manually read container ID numbers, while automated job promotion eliminates the need to scroll through a list of assignments on the cab data terminal in order to find the right task.

Overall, says GPA, the combined use of RFID systems at the gate and in the yard has helped reduce average turn time for street trucks calling at GCT by 10-11% per transaction.

RESULTS AND THE FUTURE

Since GPA first implemented the IDENTEC SOLUTIONS system in 2008, RFID has proven its worth in enabling faster, safer and more trouble-free operations at gate and yard, reduced highway congestion and improved turn times for truckers calling at GCT. As an additional benefit, says Bill Sutton, hard RFID data on actual truck movements has given GPA an important tool for time studies, allowing the port to check its real performance against efficiency metrics.

"Over the coming years, GPA intends to grow capacity while continuing to improve productivity and service levels to our customers," says Executive Director Curtis Foltz. "We are also committed to providing the safest working conditions and operating in an environmentally-conscious manner. Ultimately, success is all about our ability to manage equipment, processes and especially information. Without using technology to gather data in a more efficient way, we couldn't grow as we need to. RFID is a key enabling component that dovetails very well to our strategic development plan." ∎

> "Without using technology to gather data in a more efficient way, we couldn't grow capacity and improve service levels in the way that we need. RFID is a key enabling component that dovetails very well to our strategic development plan"
> **Curtis Foltz, Executive Director, Georgia Ports Authority**

The results:

- Gate trouble transactions reduced from 10% to 3% or less
- Truck turn times down by 10-11% per call on average
- Eliminated highway truck queues outside the terminal gate
- Real time, measurable data trail created for truck movements through the terminal
- Staff relocated from truck gates and container yard
- More productive working conditions for RTG operators

ABOUT IDENTEC SOLUTIONS

IDENTEC SOLUTIONS' wireless sensor-based networks are helping to transform the way industry manages and controls high-value assets, critical business processes and supply chains. Robust and highly effective in even the harshest industrial environments, IDENTEC SOLUTIONS' award-winning technology is deployed worldwide in automotive, transport and logistics, oil, gas and mining, and aerospace and defense applications. Since 1999, we have set the standard in the industrial network and active RFID industry. Today, many of the world's leading and most respected organizations, integrators and government agencies, including Audi, Bechtel, Deutsche Post, General Electric, Siemens, Unisys, Volkswagen and the US Department of Defense, rely on our technology.

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