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ENHANCING PORT & YARD EFFICIENCY

A GAME CHANGING APPROACH BY LEVERAGING MOBILE AUTOMATION

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INTRODUCTION

Many intermodal container transfers provided by marine terminal operators, inland yards, trucking companies, and rail discharge & load stations surveyed by RAF are highly efficient and successful relying on key performance indicators (KPI's) for tracking their daily operations. These KPI's help operators measure the reliability of their service but requires real-time data in order to manage dynamic schedule changes which can negatively impact productivity and cost. KPI's also help to measure and monitor operational efficiencies such as truck turn times, dwell time, and resource utilization critical for gate-in and rail dispatch.

However to date no single measure or indicator of terminal performance has been widely accepted. Like intermodal transfer costs or impedance, terminal performance is a variable. At any given terminal, it changes over time in response to numerous interacting factors. Some of these factors are internal, including the following:

- Terminal capacity, or the amount of freight of a certain type the facility is potentially capable of handling over a specified interval of time under the most advantageous conditions
- Physical layout of the terminal, which affects terminal capacity and determines how smoothly or quickly cargo can flow through the facility
- Available equipment, which also affects terminal capacity and determines how expeditiously cargo can be unloaded, transferred, stacked, stored, reclaimed, and reloaded
- Labor availability, experience, and disposition
- Terminal operating procedures and labor work rules which may either facilitate or hamper intermodal transfers
- Type of cargo and type of transfer involved
- Terminal utilization at any given moment or the percent of terminal capacity being utilized

Other factors affecting terminal costs and performance are external. They include the following:

- Delays, breakdowns, or disruptions on other parts of the transportation system due to heavy traffic, shortages of railcars or other modal equipment, shortages of truck drivers or railroad crews, accidents, inclement weather, labor strikes, and natural disasters

- Degree of coordination between modes of transportation, which determines how often and how long a freight shipment may have to wait at a terminal before being shipped out
- Various other exogenous factors which might, for example, cause freight to be held at a terminal until a large enough quantity is collected for economical transport or until a buyer or a market is found for the goods

Despite these variable conditions automation can provide a significant x-factor in your daily operation which can offset these disruptions.

OPTICAL CHARACTER RECOGNITION (OCR) ON MOBILE DEVICES IS A COST EFFECTIVE SOLUTION

Currently there are many technologies available for asset identification and process automation in ports and terminals. Other technologies such as RFID (radio frequency identification technology), DGPS (digital global positioning system) and optics (laser scanners for barcode reading) provide similar identification and tracking functions. So why is OCR important and especially suitable for use in ports, container yards, and other supply chain delivery sectors?

The fact is that OCR provides an elegant yet simple solution. An object to be identified like a cargo container has a series of numbers or a unique pattern of visually distinct elements which can be 'captured' electronically - much like a person uses a digital camera to capture a picture. This is the imaging or image capture process common to all applications of OCR. It is a passive process which requires visibility from a mobile device to capture an image of the object using its built-in camera.

Next, in a secondary process, specialized software interrogates the bits and bytes of the captured digital camera image to locate and extract patterns within. When completed, recognized patterns are assembled and an attempt is made to uniquely identify the object or objects within the image. Third, this captured data can be verified and validated against a database which virtually guarantees the information captured will be extremely accurate. And finally, automatically collecting this highly accurate data and information in real-time can be accomplished using an existing smartphone, tablet, or PC which makes this solution very attractive because eliminating your current manual procedures is now economically feasible. This is particularly true for any operation which handles 2 million TEU movements or less per year!

OCR is widely used around the world for the identification of equipment markings (i.e. the written text of truck license plates, container number stencils, etc.) and also to record the condition of the equipment itself. The key benefit of OCR is it provides a reliable method of identification, without requiring application of any tag or device to the asset, and also provides a visual record of the asset at the time of reading for record archive.

What started as a solution focused on the use of OCR for security purposes (e.g. identification of license plates at a port entry/exit gate) has evolved into a highly sophisticated automation application which is scalable, mobile, cost effective, and can be used for capturing container ISO codes, safety seals, and GPS coordinates which benefit many operational areas within a port or yard for recording, tracking, and automatically transferring container data in real-time to various yard management systems. Best of all this automated software solution can all be

implemented by repurposing existing smartphones, tablets, or PCs and does not require customers to purchase any new specialized hardware or expensive equipment.

THE GAME CHANGER – WHAT PROBLEMS CAN BE SOLVED

The smooth and rapid processing of incoming and outgoing road vehicles at the gate is a very important factor in efficient terminal operations and gate utilization is a valuable measure for container terminal operators.

Even with a high levels of mechanization, labor costs form a large part of total terminal costs and it is important to accurately monitor labor costs to understand what the productivity per man-hour is over a measured period. Take an example operation where manual Gate-in is typically manned by two employees per gate lane. The first employee manually writes down the container ID, safety seal ID, and performs other pre-gate recording activities such as the verification of the driver, truck, weight, and examines the containers shipping and customs related documents. The second employee simultaneously performs a physical inspection of the entire container and notes any observed damage. Note if damage is observed, a detailed secondary inspection would occur at a later date requiring additional forms and photographs, to be manually dealt with, and entered into the terminal IT yard system. At the gate, once the truck and container information is received, the gate employee will manually enter all relevant data into the Terminals IT yard system and a gate pass will be issued to the driver instructing them to proceed to the interchange area or stack to meet a loader dispatched from the terminal IT yard system.

Manual gate-in efficiencies are a function of performing all the steps needed to inspect, capture and document all relevant data into the terminal IT yard system in real time. Capacity is limited by the number of physical lanes and the average time per entry. Increasing throughput per man hour saves costs and can reduce long truck queues and potential traffic hazards during peak periods

By automating this manual process using Argosy Intermodal OCR software with a mobile device, gate-in processing can now be streamlined reducing transaction times by ***50%*** or ***more***! This is accomplished because RAF's solution can reduce your manual data collection and keying process as well as further automate your inspection process using the advanced features available from your mobile device to electronically generate an inspection form which automatically transmits your data to the terminal IT yard system in real-time. Furthermore by using the embedded camera on the mobile device, you can also instantly take photos for any damages observed and instantly attach those files to your gate-in record which further reduces non-productive secondary inspection work hours.

Side-by-Side comparison between a manual gate-in process verses automated using Argosy Intermodal OCR software:

Manual	Automated
☐ 2 Employees/Gate 	☐ 1-2 Employees/Gate 
☐ 4 Minutes/Truck	☐ 2.5 Minutes/Truck
☐ 150 Gate Passes Issued/Day	☐ 231 Gate Passes Issued/Day
☐ 4 Gates Required	☐ 3 Gates Required
☐ Est. Cost/Gate = $520K/Yr.	☐ Est. Cost/Gate = $394K/Yr.

24% Cost Reduction

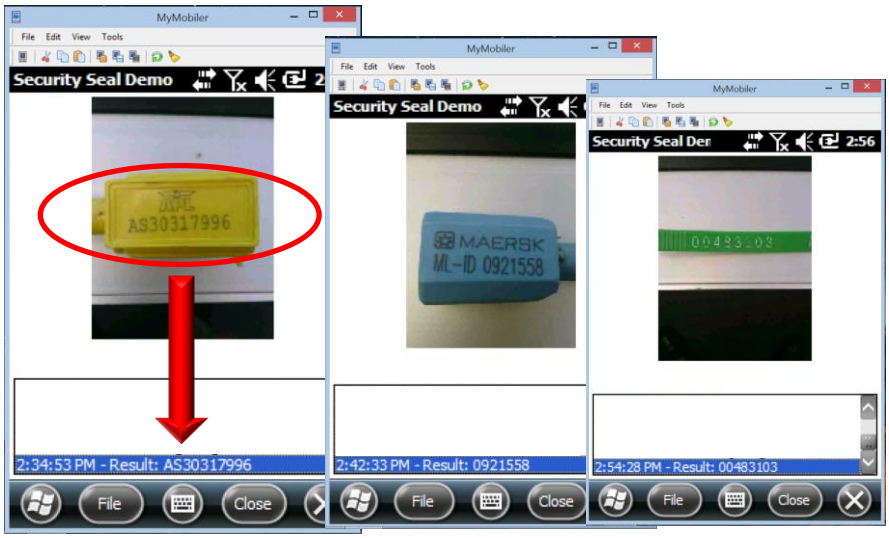
EXAMPLES OF DATA CAPTURED BY ARGOSY INTERMODAL

RAF's OCR will automatically capture all standard ISO 6346 coded containers regardless of mobile device type and includes recognition of the three alpha character owner code, alpha character category identifier, six digit unique numeric serial number and the calculated numeric check digit.

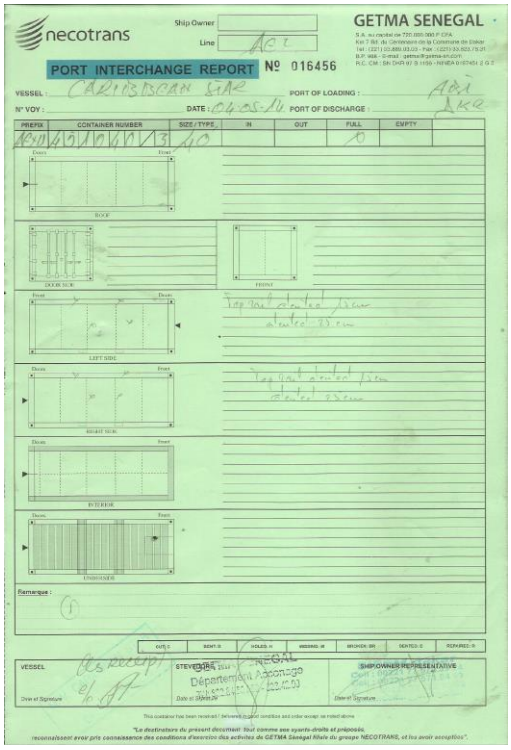
RAF's OCR engine will also image the container length, height, and type of container being transported for record transaction archive.

In addition to reading containers, Argosy Intermodal will also recognize serial numbers on security seals attached to a container. These seals come in a variety of styles which include plastic with printed alpha and numeric characters as well as barcode (reference example 2).

Example 2



INSPECTION DATA CAPTURED



Currently many shipping companies rely on paper inspection forms to capture container inspection data. The real challenge with this approach is often incomplete data or illegible information which creates enormous challenges to archive and retrieve accurate data content. Furthermore locating these damaged containers can be time consuming and costly if a damage dispute claim is filed.

Argosy Intermodal completely automates this process by using a mobile phone or tablet to capture your container inspections in real-time. In addition, photographs can also be taken and linked to the inspection where they can be centrally stored on a server and easily searched for later reference.

With Argosy Intermodal, customers can easily create an electronic damage inspection form with simple to use pull down values and enables customers to customize their inspections at multiple locations.

In addition to tracking and aggregating data about your containers at multiple locations, Argosy Intermodal also allows you to trace where the inspection was conducted, and by whom. All data collected on a mobile device can be automatically transmitted over the air via Wi-Fi, cellular network, or sent in batches using a USB cable.

Example of a highly configurable electronic form available from a mobile device

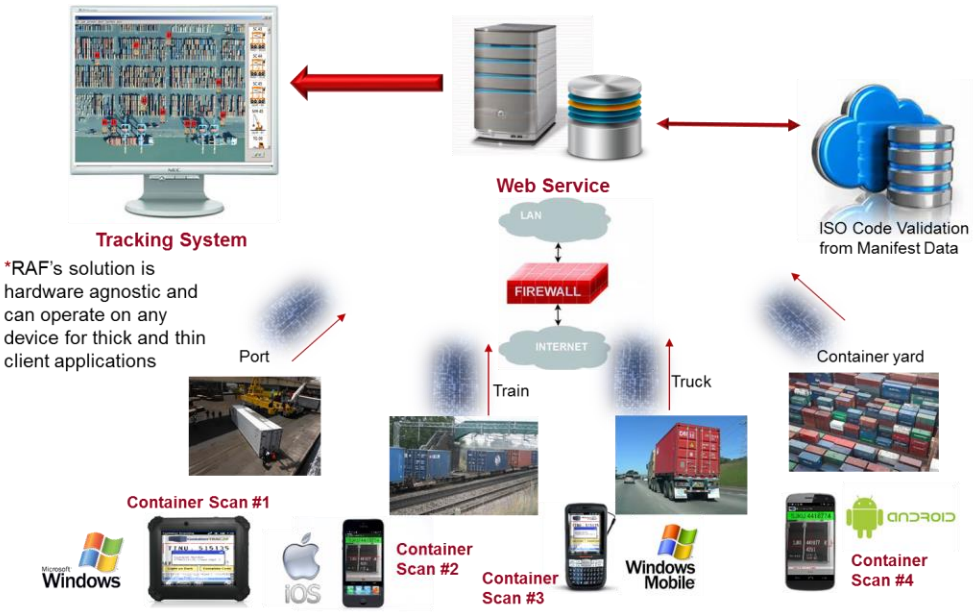
Predetermined answers speed up the process

Inspection ready to begin using embedded OCR

If the inspector finds any damage, they just touch the screen and take a picture of the incident.

Application automatically launches the camera for taking high resolution images of container damage

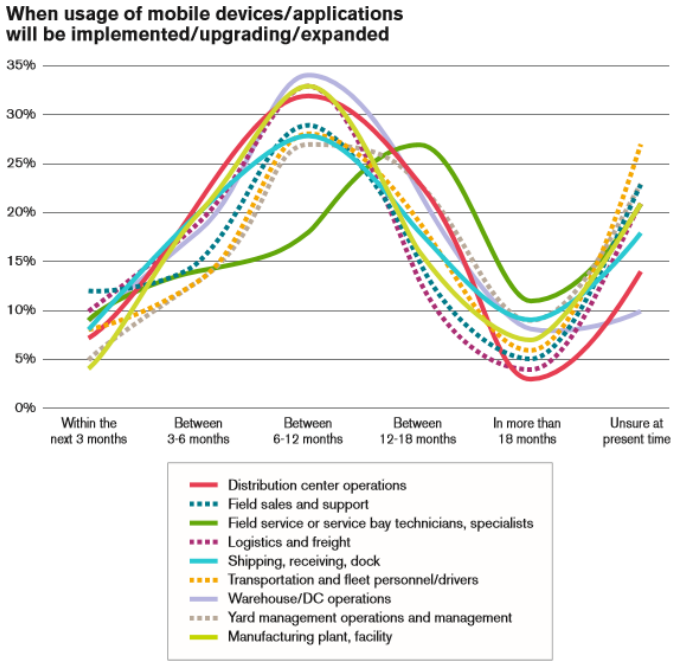
INSPECTION DATA IS CENTRALLY STORED



Container data is automatically captured at various points of transit and can be integrated into a customer's existing terminal operating system. Argosy Intermodal will operate on any mobile device or operating system, and can seamlessly be integrated into your existing yard management system using xml and our simple API.

EVALUATING SOLUTIONS – WHAT ARE THE MOST INPORTANT ATTRIBUTES

Today many new software solutions are being developed exclusively for mobility and the following chart highlights which sectors will benefit most from these latest technological breakthroughs and when:



From the data highlighted in the aforementioned chart it is clear mobility coupled with innovative software solutions and highly accurate scanning applications capable of capturing critical real-time data is on the forefront of many strategic initiatives going forward in 2017 for companies across multiple sectors.

For Logistics, freight, transportation, and yard management operations, the intersection between cost effective mobile devices with high performance imaging cameras, and reliability of software as a service is now upon us. Today there is a real opportunity for reducing many manual operating procedures by simply leveraging the current assets you already own.

Dealing with port congestion and supply chain inefficiencies have been priorities for the past several years. Earlier in 2016, the Federal Maritime Commission (FMC) launched the “Supply Chain Innovation Initiative” which is working to develop process innovations that will improve the reliability, resilience and competitiveness of the nation’s global supply chain.

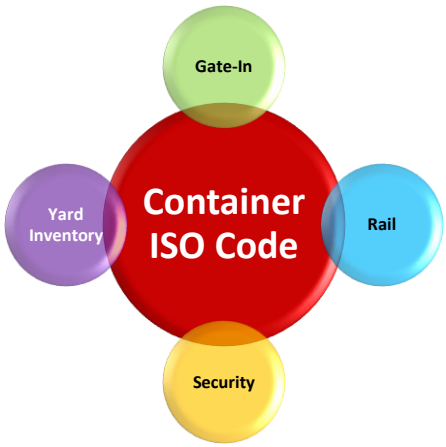
Argosy Intermodal is a clear example of an innovative solution which can improve your current manual process and a typical customer can expect a Total Cost of Ownership (TCO) return on investment (ROI) in 6 months or less.

PRODUCT BENEFIT SUMARY

- Argosy intermodal is a very low cost and simple solution compared to alternate data capture technologies
- Mobile OCR applications are ideally suited for intermodal terminal operators which will improve gate utilization, asset visibility and tracking while reducing your labor cost
- Mobile OCR provides scalable gate control to eliminate backups during peak traffic periods
- Captures accurate real-time data for maintenance and repair to minimize costly claim errors
- Provides high resolution images for containers, chassis, and safety seals along with location/coordinate telemetry
- enables complete visibility during chain of custody tracking at points where alternate systems are impractical

MARKET SEGMENTS SUPPORTED

- ✓ Marine Terminal Operators
- ✓ Intermodal Shipping Operators
- ✓ Near Port and Container Logistics
- ✓ RORO Facilities
- ✓ Chassis Pools



FOR MORE PRODUCT INFORMATION

Please email your questions to sales@raf.com or call +1 (425) 867-0700