Port of Helsinki, Vuosaari Harbour Center: Automatic Gate System

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Overview

Visy Oy was selected as the gate technology provider for the Port of Helsinki, Vuosaari Harbour project – a massive undertaking which involved moving and combining two commercial port areas from the center of Helsinki to a new, single, location east of the city. The Vuosaari Harbour project was a Greenfield, the nature of which was the first of its kind in an EU capital. After years of planning, building, and testing, the Vuosaari Harbour Center went live on 24 November 2008. Overnight, and in the midst of a staggering snowstorm, the new port went from 0 to 4,000 gate transactions per day.

The Helsinki Port Authority, each of the three terminal operators (Finnsteve, Steveco, and Multi-Link Terminals) and Finnish Customs Agency use Visy technology specifically designed for their unique operations. The Port Authority uses Visy Port Access Control System (PACS), the terminals use different versions of Visy's Terminal Gate Operating System (GOS), and Finnish Customs uses Visy Alarm Gate for border traffic control management. Visy technology manages all vehicular traffic for the entire Vuosaari Harbour area and provides access control for pedestrians and people. The interoperable Visy systems manage a massive volume and wide variety of traffic serving a three-pronged purpose: Reduce operating expenses, optimise safety and security, and increase throughput capacity at the gates.

System design

The Visy network at the port is comprised of the PACS for the Port Authority and three separate GOS's, one for each terminal operator, and a Customs Agency GOS. All of the systems in the network function together to ensure that cargo moves quickly and efficiently. The Finnish Customs Agency has an extraordinary set of requirements at the port. Firstly, Customs requires the ability to clear cargo before it leaves the port area. This process is done through the Visy PACS Net web software, which is also used by the Port Authority and all of the operators to book appointments at the gate. Secondly, Finnish Customs uses Visy Alarm Gate (a completely separate system) to collect license plate and container code data for their risk analysis procedures. Thirdly, the Customs Agency has rail-side X-ray portals which use Visy optical character recognition (OCR) for container code identification. The access and area control needs of the entire port area are diverse and completely managed in the Visy network.

The Vuosaari gate system is flexible, allowing for traffic lanes, checkpoints, remote areas, interfaces with multiple external systems and a host of supporting technologies to be added or subtracted as the business needs of the harbour area change over time. This list also includes OCR for automatic container code and license plate recognition (LPR), active and passive Radio Frequency ID (RFID), damage inspection imaging, web technology, and rail applications. The Vuosaari gate system does not depend upon any single technology for the system to operate. If the Port Authority or operators decide overnight to deactivate any technology or change lane configurations, the Visy systems can adapt without adversely affecting operational performance. The Finnsteve Terminal has six dual direction lanes for ultimate flexibility, and, despite competition, the Steveco and Multi-Link Terminals share several traffic lanes within the port. Overall, the terminal operators have a high level of flexibility with a small number of traffic lanes and maintain the opportunity for TEU growth.

Entering Steveco: The gate system provides a high level flexibility with a small number of traffic lanes.

All software in the Vuosaari Harbour gate system was designed in-house by Visy engineers, and no 3rd party software is used. This is advantageous for the Port Authority and operators alike because if any software changes should be needed, there is a single source to reconfigure and redesign as necessary. For example, Visy IRIS (Intelligent Recognition and Imaging Software) for OCR uses an advanced 'neural network' system to learn new character fonts. As a practical application this means that if containers lacking ISO standards and check-digits or trailers with highly irregular ID markings visit one of the terminals, the OCR can learn to read the new ID codes and any RFID equipment can be used in the same sytem. This advanced feature of Visy IRIS makes the software adaptable to ports and terminals worldwide.

All hardware in the Vuosaari Harbour gate system is commercial-off-the-shelf (COTS) with standard interfaces. No customised or modified hardware is in use anyplace in the system. By using COTS hardware, the end-user has a great deal of flexibility in service, support and maintenance and will not be dependent upon any specific hardware component for the system to function. Furthermore, there is never a need to use customised hardware for applications such as damage inspection imaging and OCR. There are scores of high quality manufacturers that produce COTS cameras (analogue, line scan, infrared, area scan, and IP based) for port applications. Although hardware components need to meet a certain technical specification, it is simply not true that lights, cameras and other equipment need customisation.

Upon entering the port there is an extensive traffic guidance system for trucks.

Line scan: Finnsteve Terminal uses two Visy line scan camera portals for damage inspection imaging and pre-gate recognition.

OCR and RFID

There is a common misconception in the industry that OCR and RFID are competing technologies. The Vuosaari gate automation project shows how OCR and RFID are complementary technologies that automate suitable processes. Although there are common applications for which both OCR and RFID can be used, there is only one technology that is the right choice for a specific application. For example, the Finnsteve Terminal uses two Visy line scan camera portals for damage inspection imaging and pre-gate recognition. The system uses OCR for automatic container code identification and LPR and matches the data to a traffic event. Given the traffic patterns for the terminal, it would not make for a sound business case to tag each truck with active RFID for vehicle identification; therefore OCR for LPR is the most suitable technology to identify the trucks. On the other hand, each piece of fleet machinery (which is regular port traffic) is equipped with an active RFID tag to automate access control between the port, the logistics area and other checkpoints. Although OCR could also be used to identify the fleet machinery, it is more cost effective and efficient to install RFID readers at specific checkpoints and permanently fix tags to the equipment for access control. Visy IRIS manages all OCR and RFID applications in the Vuosaari Harbor gate system.

Putting it all together

The most defining characteristic of the Visy gate system at Vuosaari Harbour is the systems' ability to handle a massive amount of diverse traffic and allow end-to-end interoperability between the Port Authority, three independent terminals and the Customs Agency. The port-wide automation is achieved mainly through extensive XML messaging with Visy XML Gate, a software package for automatic data exchange between IT systems that runs behind the scenes in Vuosaari.

A simplified example of the traffic automation in Vuosaari Harbor is when two appointments for the same truck are booked to visit both the Steveco Terminal and the Finnsteve Terminal to drop-off and pick-up containers, respectively. When the truck arrives at the port's main-gate area, access is automatically granted and is directed to the Steveco Terminal to drop-off a specific container. At the Steveco Terminal the Visy system, which has complete interoperability with the Steveco booking system and terminal operating system (TOS), manages the complete gate transaction including all data collection, data exchange with the Steveco IT systems and the port system, and gate processes. Finally the empty truck receives an automatic exit permit to leave the terminal.

On route to the Finnsteve Terminal, the truck drives through a pre-gate portal where the visit is announced to the Finnsteve TOS thus allowing for immediate processing of the transaction. Once the truck picks up its container at the terminal and proceeds towards the out-gate, it drives through one more Finnsteve portal where a high-resolution damage inspection image is taken (the image can later be used to challenge insurance claims) and stored to the Visy database. Next, the truck receives an automatic access permit to leave the port based on its license plate number and container code or the container might be flagged for a customs agency check in the Finnsteve TOS.

If the Finnish Customs Agency needs to clear the cargo the Visy system will automatically direct the truck to visit customs before granting permission to exit the main-gate. Customs can automatically authorise the release of the cargo via Visy Access Net and grant the truck permission to leave the port. Throughout the entire process the truck could also have an out of scope container that was merely hauled during the transactions but had no business at the port. All terminal information is protected and each terminal only has access to its own private business data. Trucks visiting Vuosaari are able to perform highly efficient, multi-terminal visits and clear customs on a single pass through the port, thus making the Port of Helsinki, Vuosaari Harbour gate system the most advanced gate system in Europe.

ABOUT THE AUTHOR

John Lund is the International Sales Manager for Visy Oy in Finland. He is a graduate of Northeastern University (Boston, MA, USA), Rochester Institute of Technology (Rochester, NY, USA), and the Defense Language Institute (Monterey, CA, USA). His background includes a mixture of projects for ports, terminals and logistics centres, and the application of western economics to businesses in transition economies.

ABOUT THE COMPANY

Visy is a high performance software company specialising in access and area control solutions for port authorities, public and private logistics terminals, customs agencies, and government organisations. Visy has designed and implemented the largest customs agency OCR system with an alarm database solution between the EU and the east, and the largest Port Access Control System (PACS) in northern Europe. Visy provides access control and OCR systems to Fortune Global 500 companies.

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