

**SMART IDENTIFICATION SYSTEMS IS AN IMPORTANT ELEMENT
FOR MONITORING,
TRACKING, AND AIDS TO NAVIGATION IN THE SMART PORTS**

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ABSTRACT:

Ports were described by several names and titles. In terms of size there are small, medium, Large and mega ports, in term of ages, they were specifies as old, modern or new ports. In terms of generation, they have named themselves accordingly 1st, 2nd, 3rd, and the 4th generations. For the goods operation there are central port, and hub ports and so on it is endless chain of names aiming at obtaining a market place in the expanded maritime transportation. Smart ports, intelligent ports and Information ports are the new version of the advertising of this nonstop progress. However, smart ports have received a sound acceptance in the freight business; leading ports such as Rotterdam, Singapore and Vancouver have already declared themselves as Smart Ports.

Smart ports necessitate that every single component in the port operation to be functioning in smart way. Smartness may be defined that a processes of less paper, less time, less effort, manpower and less cost with maximum turnover and value added benefits. Increasing the gap between the lessees and the maximums denotes the smartness of the port.

Monitoring and tracking systems in smart ports add to the smart operation. Efficient tracking system helps the management to locate the position of every single mobile target in and near by the port. Incoming trucks fitted with smart tracking device helps to allocate proper loading/unloading slots in the port. Port navigation with smart identification system facilitates piloting, minimize the berthing time and assure the required safety. Smart port is a comprehensive integration of all operation in the port and in its affiliated hinterlands.

The objective of this paper is to review the requirements of the smart ports with analytical thoughtstaking into account the identification systems operated in the other leading ports and the potential capabilities of the ports in developing countries. The analytical review may draw a Road Map for the existing ports to be converted to smart ports in terms of locating the position of vehicles and improving the traffic management of trucks, and sorting the containers allocation and their security. Virtual aids to navigation and berthing also benefit from the identification system based on new technology of GNSS positioning and GSM communication systems provide an essential means to assure safe navigation in ports.

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However in order to become a member of exclusive club of the smart ports, the country and the administration, should also move toward the smartness with utmost development of intelligent management and human resources.

1- INTRODUCTION

Identification of moving targets in ports is important element to monitor tracking and assure safe navigation in the smart ports. Marine ports are the gate way in the international trade driving of the economic growth of the country. Any type of port can be seen as the initial interface between a country and the trade partners with whom the country does business.

Some ports have declared themselves smart ports; many other are performing their operation with high efficiency without declaring themselves smart ports. Rotterdam Port Authority, Singapore and Vancouver are among those ports that declared the smartness of their operation. Each of those ports has its own features and capabilities with some common factors between themselves but not identical.

Investigating the operation of other well advanced ports around the world, and analyzing the number of shipping of their turnaround time, number of ships, number of TEUs handling, well draw the road map for the developing to push forward towards the smartness.

2-COMMON FEATURES OF SMART PORTS.

- *Simplicity of operation.*

One of the main issue of simplicity and efficiency of the port operation is well implemented in the maritime port logistic clusters, and absolute need to improve the level of automation in relationship between port operators and in the management of the document flows, where date and information need to be disseminated among stake holder parties in the port.

The Electronic Data Interchange EDI is capable of establishing advanced technology integrated with the Intelligent Transport (IT) system. Computerize and automation would simplify, standardize, render more efficiency and accelerate the movement towards the economy. Interaction between operators in different port communities, national and international communities would be sound good and also is important.

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- ***Maximize resources utilization and the turnaround time***

Competition among ports continuous increase as the differentiation of hub and mega ports progress. Smart ports should plan to introduce high technology services in their container terminals to maximize the terminals capacity.

Trucks automated and guided vehicles or straddles are the equipment used in shifting the container from one place to another. Container terminal operator should challenge to minimize the operational cost while trying to maintain excellent service quality and to maximize operational effectiveness.

- ***Communication and accessibility to information***

The communications in the smart port is the heart of the connectivity required between the ports, its clients, its vendors, security, and others who play a role in the desired secure and profitable trade relations. Extensive array of communications and events management capabilities can be configure to smart port operational requirements, traffic management, board and assembly meetings, conference calls, project updating, asset reservations, and much more. These capabilities include, telephony – phone and fax, Email notifications - triggered by events, text messaging and instant response for interoperable IP-based communications.

Smart ports should have a legal and constitution framework to govern, approve and organize electronic documentation. Electronic documents may include all shipping documents affiliated to maritime transportation such as Bill of Lading, charter agreement, cargo manifest, payment invoices and receipts, cargo insurance, and customs clearance.

In the quest to improve vessel turnaround times, smart ports should more rely on wireless technologies to enhance the flexibility of operations and improve efficiency, not only the concerned departments inside the port but also to be connected to the other ports in the vicinity and to the regular shipping liners.

In 1970's the world largest container ports was New York followed by Rotterdam, 45 years later the largest and the second largest ports in the world were Shanghai and Singapore respectively. It is clearly show that the weight of the shipping industry and the maritime business has shifted toward the South East Asian region. The top ports in the last three years were designated as Smart ports based on the use of new technologies of communications, computerization in addition tracking and monitoring of cargo and the containers movements.

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3-SMART CONTAINERS

Containers that are using sensors and systems to track and report data on their contents, unauthorized access and physical location hold huge promise for improving supply chain efficiencies and strengthening security.

Once port declared itself as smart port, then information about the location and the cargo contents should be disseminated to other components and stake holders of the port. Since decades ago, many containers were fitted with sensors and communication systems. Shipping management companies, liners and cargo owners were able to real time monitor their container, and their cargo inside the containers in port, at the roads or even at sea.

Container tracking and monitoring, are essential for the smart ports, special sensors mounted in each container can provide in real time the condition of the internal space of the containers. Information about temperature, humidity, time of open or seal the container even more unauthorized movement or opening of the container can be instantly sensed, whereas owner and other concerned parties of the cargo can be notified.

Smart ports have a driving mission to move cargo quickly and safely through the port. To accomplish this mission, a reliable, flexible, and secure flow of information is vital. Therefore complete control and management of the smart ports containers should be an active part of the monitoring and tracking system.

4- ELEMENTS OF MONITORING AND TRACKING SYSTEMS

Monitoring and tracking process requires two important information of the tracked object, which are the accurate position and the real time of such position. A tracking unit is the device, normally carried by the moving vehicle or container, that uses the GPS to determine and track its precise location, and hence that of its carrier, at a periodical intervals.

The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or Internet-connected computer, using a cellular (GPRS or SMS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real time or when analyzing the track later, using **GPS tracking software**. Data tracking software is available for smart devices with GPS capability. Typical GPS tracking systems used in commercial fleet management have two core parts: location hardware and tracking software.

Other devices known as a *GPS beacon*, this kind sends the position as well as other information like speed or internal situation of containers such as temperature, and

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humidity at regular intervals, to a determined server, that can store and instantly analyze the data. In all cases tracking requires a system or means to radio and electronic transfer the information to the channels and port management centers. The efficiency of the identification system depends upon the following parameters of the positioning and timing availability;

Availability: To assure proper tracking the former information, position and time must be available 24/7 end-to-end real-time container tracking and security monitoring services optimize supply chain security management, uninterrupted flow of data.

Accuracy: Position and time accuracy are important factors for the management of movement trucks in or near by the port area, position accuracy within the range of sub meter can be achieved by Global Navigation Satellite System GNSS, time accuracy is required for the communication. GNSS are able to provide time accuracy of the range of 50n. Second.

Reliability: Monitoring and tracking depend on comprehensive closed loop system include, positioning and timing. Communications system based on GSM or VHF will assure the continuity of the tracking process.

Continuity: Continuous flow of information should be maintained. Satellite signals are usually weak and subject to the intentional and unintentional interference. To assure that position and time are available, backup system should be envisaged to maintain the tracking operation.

Accessibility: Port operation is like a bee network, where are many internal movement of targets, such as containers trucks, private or port operation vehicles, or even ships and boats exist the port or in the near by the approaches or already committed into the approach navigational channel. Then accessibility means that the possibility of target when enters the tracking zone of a port, the tracking system should be able to acquire the necessary information of such movements.

Integrity: Integrity of the tracking system means that, in case a malfunction takes place in the tracking system. The control operation should be identifying, the outage of the system must be contained and be able to restore the operation in short time. These operations necessitate continuous observation of the performance of the monitor and tracking system.

Trust-ability: Once the monitor and tracking system is operated all users should be able to trust the information provided by the system, the trust of the system will eliminate the doubt about the information and will help to provide instant decision in the right time.

5- MONITORING AND TRACKING SYSTEMS IN PORTS

Many tracking systems are available worldwide; the competition between the manufactures of the equipment, the dealers of the producers and the services providers enhances the tracking technology and brought the cost down to a reasonable level. The systems are able to be integrated into the Intelligent Transport system, IT of ports. This Integration creates a comprehensive all function integrated systems, operated by centralized control mainframe. Trucks and fleet management system cannot be effectively operated without a mean of tracking and monitory system in the smart ports. To achieve the monitoring and tracking of ships at sea or trucks on the roads away from the shore GSM coverage out of VHF range an extra service in required based on communication satellites, the Geostationary INMARSAT or the low orbit IRIDIUM communication satellites providing information.

The Automatic Identification System (AIS) is a ship-borne transponder system designed in the first instance for maritime safety and in particular collision avoidance. It consists of a transponder unit including GPS, VHF transmitter / receiver and display / terminal. The unit broadcasts a message at regular intervals containing its identification, position, speed, course plus a number of detailed items about the ship and its cargo such as ship length, draft, cargo type, ports of providence and destination. The range of coastal range of AIS receivers is typically 40 nm. The range but can considerably be longer if the receiver is installed on an elevated position, and also during the preferable atmospheric conditions.

Information updates depend upon frequent of movements of the object. The transmission unit can be manually or automatically activated depends upon the situation. Inside the port area, at the check points the transmitted information can be triggered by the control center.

Ships, boats and Tugs inside the harbor and at the approach channel are guided in their updating their data by the use of AIS depends on the speed and the course alteration of each moving ship. The AIS system is based on transponders located on board ships. VTS and port management center can also be supplied with AIS units to be enabled to receive information from ship boats and tugs as a part of the comprehensive tracing and monitoring system at the AIS dedicated VHF frequencies. Once set up for a voyage, information is transmitted continuously from each vessel without requiring attention from the mariner. The introduction of AIS provides an alternative way of obtaining information for better traffic management in ports.

AIS helps in ship to shore and shore to ship, communication a VTS tool for traffic management, help identify vessels, assist in target tracking, simplify information exchange (reduce verbal communication), and provide additional information to assist situation

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awareness and safety. Incoming truck to the port at the connecting road will be assigned to the system at the first crossing of the triggering devices at the toll station.

5- TYPE OF INFORMATION

Identification varies according to the tracked target. For trucks and port operation vehicle the registration and plate number are essential information, type of vehicle and properly name of driver or authorized person for the vehicle may be included if available. Container data includes number, type and capacity. Ships data include information about the arrival of vessels, information about berthing plan, customs manifests, crew and passenger lists for passenger ships, information about dangerous goods if carried. The static data for ships and boats include ships, MMSI, Call sign and name IMO Number, type of ship, and, flag. Dynamic data of ships boats and tugs include real time positioning, heading and other navigation information. Ship's dynamic data are based on the onboard sensors and transmitted to the smart port control center through the VHF, AIS systems.

Targets dynamic positioning and timing are based on any of the GNSS GPS or GLONASS, supported by ground or satellite augmentation to provide higher accuracy and secure integrity. The smart identification and tracking system monitors and tracks trucks, service vehicles, mobile cranes, container and other mobile equipment using the local (GSM) network. The rate of updating of the dynamic data depend the movement speed of each target connected to the monitoring and tracking system.

A virtual Aid to Navigation (AtoN) can be used in situations when it is impractical to equip or time does not allow the equipping of navigation buoys with an AIS transceiver. In this case, AIS of the port monitoring system can configure any changes or shift in the position of the buoys which will be displayed on an electronic chart or mimic display system.

6- CONCLUSIONS AND THE RECOMMENDATION

Smart ports operations is active and pay back its investment cost when it is affiliated with smart cities as well intelligent management system. The back bone of the smart port is computerization, automation and communication networks. Transparencies of information, centralization process (one window) clearance, add to the feature of the smart ports. Smart ships, smart cities and smart legislation environment will enhance the smart ports. Accurate positioning, reliable communication and fast flow of information have made it possible to monitor containers and its valuable cargo, improvement supply chain efficiency and reduce costs.

Conventional ports are invited to join the smart ports exclusive club, regardless their size of the port, the internal operation process are counted improving the individual platforms in the port will create a smart port. Identification and monitoring systems for vehicles, containers and ships are available in the global market with modern technologies.

Government should enhance the transformation of the conventional ports to the updated smart ports by mandate the best strategies for securing, directives and compliance requirements to protect the handling of the electronic documents of the smart ports.

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