

OPTIMIZATION OF OPERATIONS IN DURRES PORT CONTAINER'S TERMINAL

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Abstract

This paper gives an overall picture of various operations in Durres port containers terminal. Since this port is very new in containers handling operations, there are a number of issues to be addressed. Container terminal operators are providers of container handling services and with the shifting trend toward containerization of exports and imports, pressure on container terminal operators has increased in order to handle containers efficiently. During the recent years, the volume of general cargo that has been handled in this port has been gradually reduced and instead, a continuous and rapid growth of containerized cargoes has been observed. In order to have an effective and productive terminal, a number of factors need to be studied, because the higher the terminal productivity, the higher the difference between the revenues and the costs will be. The time in handling container ships is crucial; therefore it becomes necessary for any containers terminal to handle the containers in the most efficient manner where there is a smooth flow of containers in and out of terminal. Taking in account the space limitations of Durres port containers terminal, this is of vital importance. The operational activities of the terminal should be in such a way that it must be able to handle maximum no. of twenty foot equivalent unit (TEU's). For this purpose, it is necessary for the Durres port containers terminal to perform its activities in coordination with all other activities. This will result in a reduced waiting time for ships, less turnaround time for trucks, better space management, lower dwell time, customer satisfaction, and more TEU handled annually.

Key words: optimization, information management, terminal, RDIF, automated systems, safety, security

JEL Classification: L90

1. Introduction

Global container trade has steadily increased over the last two decades much faster than international trade. The average annual rate in thus period has been estimated to be around 8 - 10% (UNCTAD, 2009: ILS, 2010)

For this purpose in port and terminals industries, optimization of operations is not so much to develop the unmanned terminals – it is much more the installation of systems aimed at making jobs of terminal operations simpler. The aim of the

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optimization is to allow terminal operators to concentrate on the business of moving containers as quickly and efficiently as possible. Optimization does not necessarily mean the automatic monitoring and control of the terminal equipment. It can mean the installation of a radio data network between terminal's planning system and its yard based equipment, an investment which provides significant benefit to terminal operation. The purpose of terminal optimization is to reduce the time on every cycle and producing a safer environment without operational delays.

A container's terminal can be ideally divided into two areas, the quayside and the landside. The quay side is made up of berthing positions along the quay and the quay cranes that load/unload the containers. The yard serves as a buffering for unloading and loading of containers. Although congestion issues are often disregarded, operations are usually slowed down because of overloaded areas in the yard and this is the case of Durres port as well, and the congestion spreads rapidly to the whole system.

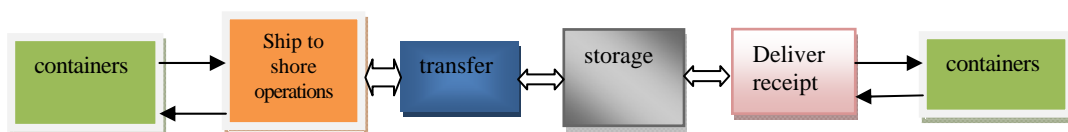


Fig 1. The operations in container's terminal

There are different solutions for effective and efficient operation. All these solutions differ from terminal to terminal based on the size of the terminal, number of yards, distance of the storage area from the quay side, etc.. There are system like, trailer positioning system (TPS) which provides an accurate positioning of the trailer in terminal (this is very effective in big terminals) so that to locate where container is stacking and through which path trailer is moving.

In order to increase the efficiency of a container terminal automation of the container terminal (ACT), establishing an advanced terminal infrastructure by equipping it with advanced equipments and high level of information network is very important in terminal operation. The cargo transferred by containers among worldwide trade using maritime transport is continuously increasing with an annual growth over 8%. In Western Europe and in other developed countries all over, there are existing containers terminals and new container terminals are being built. These terminals are fully automated and they are unmanned and controlled by advanced equipments.

In port and terminals industries, automation is not so much to develop the unmanned terminals – it is much more the installation of systems aimed at making jobs of terminal operations simpler. The aim of this system is to allow them to concentrate on the business of moving containers as quickly and efficiently as possible. Optimization and automation does not necessarily mean the automatic monitoring and control of the terminal equipment. It can mean the installation of a

radio data network between terminals's planning system and its yard based equipment, an investment which provides significant benefit to terminal operation. The purpose of these systems is to reduce the time on every cycle and producing a safer environment without operational delays. There are different solutions for effective and efficient operation. All these solutions differ from terminal to terminal based on the size of the terminal, number of yards, distance of the storage area from the quay side, etc

The systematic choice of location and information exchange between equipment requires more exact rapid information networking than traditional container terminal in order to minimize the efficiency of container yard and safe handling and storing more containers at a time due to large size container ships. The introduction of automation is important for rapid handling of containers which are coming IN and OUT through gate. Building an information system is required as a mean of strategy which guarantee predominant differentiation as compare with others as present world faces the infinitive era of competition between the world's major ports. If we have to refer to the Durres Container Terminal, the labor force is drown from the local labor force available, and is paid based on the container moves. The containers are moved to the nearest location and not in all cases where the container was planned to be stored. This action may result in a second move of the container, thus increasing the handling time, and the associated cost per container move. In order to overcome this issue the system functional requirement where to:

- Identify automatically the carrying equipment,
- Identify the container move
- Display the exact move required for the given container to the operator
- Ensure that the container is placed in the planned location
- The system should allow a degree of flexibility in order to allow exceptions

2. Methodology

This paper will study the current situation of the Durres Port mainly focused on the operation of the Containers Terminal. With the strong tendency that the cargoes that are being transferred through Durres Port have to shift toward containerized cargoes, the Containers terminal plays an important role in the overall performance of Durres Port, therefore the effectiveness and the productivity of this terminal is important. On the core of this study, are the berth allocations and scheduling, quay crane allocation and scheduling management systems and the automated systems needed to support a better performance of the containers terminal, to make the Port of Durres more compatible, competitive in the region, in order to enlarge its commercial effects into larger hinterlands.

The study will focus on the following:

- On overview of the current automation technology in the Containers Terminals
- The existing situation of the Containers terminal, an overall picture,
- Durres Port container terminal equipments and their capacity,
- The container volume handled through Durres Port Containers Terminal and the traffic forecast
- The existing of radio data network or other information and management systems in the terminal

In this paper we will analyze two scenarios of operation of the terminal:

Scenario 1: the operations are carried out by terminal personnel; no software or other automation of the terminal is in place

Scenario 2: the terminal operations are automated and RFID is used.

The results of this paper will be based on the real situation in the Durres Port Containers Terminal and based on this situation some recommendations will be drawn in order to contribute in improving the efficiency of the Containers Terminal

3. Equipment and technology of automation

Container terminal operations and their optimization have received increasing interest in the operations of the Durres port containers terminal. Even though a small terminal at present, this terminal regarding the traffic forecast is increasing rapidly, therefore optimization of the operations is vital for the competitiveness of the port and terminal.

In the quay it is very important to have an optimization of the operations through an integrated planning system. The realization of automatic operation is achieved based on operation commands from the computer on the crane to which the commands are transmitted from the planning computer in the container terminal via optical fiber cable.

- Kinds of Automatic operation

The automatic operation includes four types as described below:

- Loading: operation to load the containers in the yard on to the chassis
- Unloading: the operation to unload the containers on the chassis in the yard
- Marshalling: the operation to marshal the containers in the yard within the yard
- Move: the operation to move only empty spreader

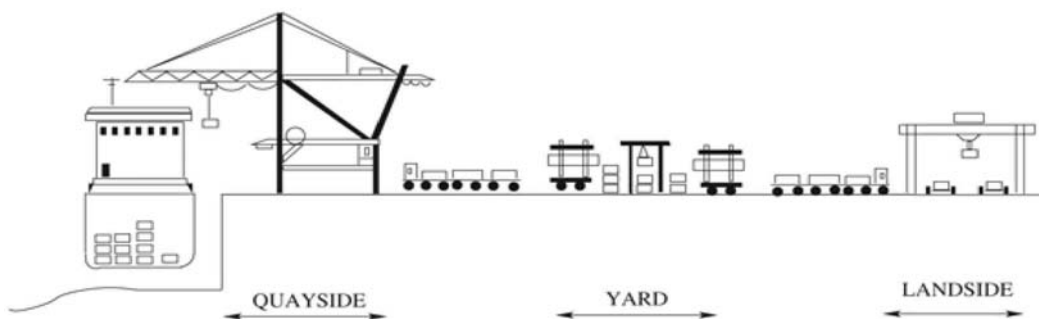


Fig2. Container terminal operations

Characteristics of the high speed automatic operation system: the objective of the automatic operation of this crane is to improve the container handling efficiency in the yard, and can be concluded to cope with natural disturbances (weather conditions like rain, fog, and wind) specific to outdoor environment. The concept of this concept of automation is “Fast”, “Accurate” and “Safe”.

3.1. RFID Technology in a Port

Radio Frequency Identification (RFID) has been successfully used in transportation and manufacturing since mid - 80s and its use is growing rapidly as costs come down and benefits are recognized. The primary advantage to RFID in a port/terminal application is that it is an “automatic” data collection technology. That is, no operator intervention or action is required. Whereas other forms of data collection, whether bar codes or manual methods, depend on employees to record information, RFID relieves them from this time consuming and error-prone process. Better utilization of employee’s time. In addition, security measures can be significantly enhanced through use of RFID. There are five areas where RFID can be effectively used in a port or cargo/containers terminal:

- Access control
- Container security
- Container identification and location
- Activity tracking, and
- Regulatory compliance.

Some of these applications offer benefits to the terminal/port operator, either directly or as added services for shippers. Other benefits must be seen more as a means of simplifying compliance with increasing governmental security regulations and record keeping requirements.

4. Current situation in Durres Port Container Handling Terminal

Durres Port Authority (DPA) in order to have a clear picture of the exploitation rate in port, has implemented the separation of terminals and has improved their

management. Undertaking a number of measures for the restructuring and development of the infrastructure and equipments, the port has had some limitations regarding handling capacity. In order to face this, DPA has implemented contemporaneous management methods making it possible to keep a balance on the berth occupancy rate in order not create congestions in the port. To illustrate this, we have calculated some indicators of the operational performance for the general cargo and bulk terminal.

Durres port has a short history in handling containers. Until 1996, only 20 feet containers could be handled in this port due to the lack of proper infrastructure. Actually Durres port Authority is managing the new containers terminal which is capable of handling all types of containers from 10 – 45 ft.

The development of the containers terminal in wharfs 6 & 7 made it possible to establish new markets for the Durres port and has dramatically reduced the handling of general cargo. Container ships are being handled in wharfs 6 & 7 which have an overall length of 465m and a backup area for storing containers of 56.000m².

In order to support the containers terminal in Durres Port on loading unloading the container ships, there are available a number of container handling equipments like reach stacker, forklifts of high tonnage, tugs and trailers, etc

It is forecasted that the containers trafic will be in a continuous increasement, consequently the efficient functioning of the terminal as well as the new investments in procuring the handling equipments of the containers is important. Actually in the port there are three regular liners from and to Kastellon – Spania, Pireaus Greece, and Rijeka Croatia making it possible to have container ships almost everyday in the terminal.

5. Terminal Equipments and their capacities

Containers are handled in two areas of the port:

1. The containers terminal (wharfs 6 & 7), loading/unloading from ships on the quay and vice versa is done by means of a portable crane with a lifting capacity of 120 Tons equipped with a hidraulic spreader.

2. In the wharf No. 9 (ferry boat terminal) where the containers wich are transported by Ro/Ro vessels are handled by means of tugmaster, trailers and other equipments.

In order to handle 20 ft and 40 ft containers, the port has its own equipment as follows:

- A portable crane with lifting capacity of 120 Tons,
- Two reach stackers of type “MI-Jack,, with a lifting capacity of 40 Tons,
- Two forklifts of type “Fantuzzi ,, with a lifting capacity of 35 Tons
- One forklift of type “MI-Jack,, with a lifting capacity of 12 Tons
- Ten tractors and 20 trailers for the horisontal handling of containers up to 40 ft.

The containers terminal in the Port of Durres is in a continuous development and future investments are planned in procuring new equipment and also in improving the

existing infrastructure, thus creating more storage area and better handling capacities for the terminal in order to manage the increasing containers traffic.

6. The existing of radio data network or other information and management systems in the Durres Port Containers Terminal.

The continues growth in container traffic in the port of Durres appeals for a better management of the terminal operations, a better and more efficient usage of the yard area, thus making the port and the terminal more attractive for the port users and more competitive. Durres port has undergone a number of reforms being those legislative reforms, infrastructural or structural reforms. Since the information is more and more important in port industry, the port has increased its capacities to ensure a safe and secure working environment in order to safely and efficiently monitor and manage the maritime traffic, raise the level of the safety of the life at sea, improve the monitoring of the terminal in order to prevent ships generate pollution in the terminal area alongside the wharf, and facilitating more efficient maritime transport services. The Port management Information system in Durres Port provides these benefits:

- Safety – Through the VTMS the port Authorities and Harbor Master Office monitor the maritime traffic in arrival and departure from the Port in order to avoid any maritime incidents in the maritime area under its jurisdiction.
- Security – a full insight to available information on ship's history and cargo, in accordance with ISPS rules,
- Efficiency – ensures that all resources to handle ships arrival are available in time for the shortest possible turnaround. This includes resources like berths, pilots, stevedores and linesmen.
- Sustainability- taking care of port environment. One of the things this entails, is checking ship's manifests for dangerous cargoes and making sure that ships with dangerous cargo are well separated from other ships.

Access control is done through RDIF. The use of RDIF identification cards, either contactless smart cards or proximity RDIF tags with a very limited range can not only store access information such as shift, job functions allowable vehicle access, etc, but can also contain biometric information such as photograph. Equipping tugs and other equipment with RDIF tags is becoming increasingly common in fleet and yard management operations. Readers placed at gates and other access points can be used to enable access or egress as well to record exact time at which a particular truck and container entered or left the terminal.

7. The analysis of terminal optimization

Referring to the figures of the container handled through Durres Containers Terminal, in 2009 has had a high rate of growth up to 140% compared to 2005. Certainly that the Global Crises has had its impact in the Albanian market. It is important to

underline that while in the european countries all ports have suffered a negative growth of almost 15%, in Durres port the growth has been positive up to 5%.

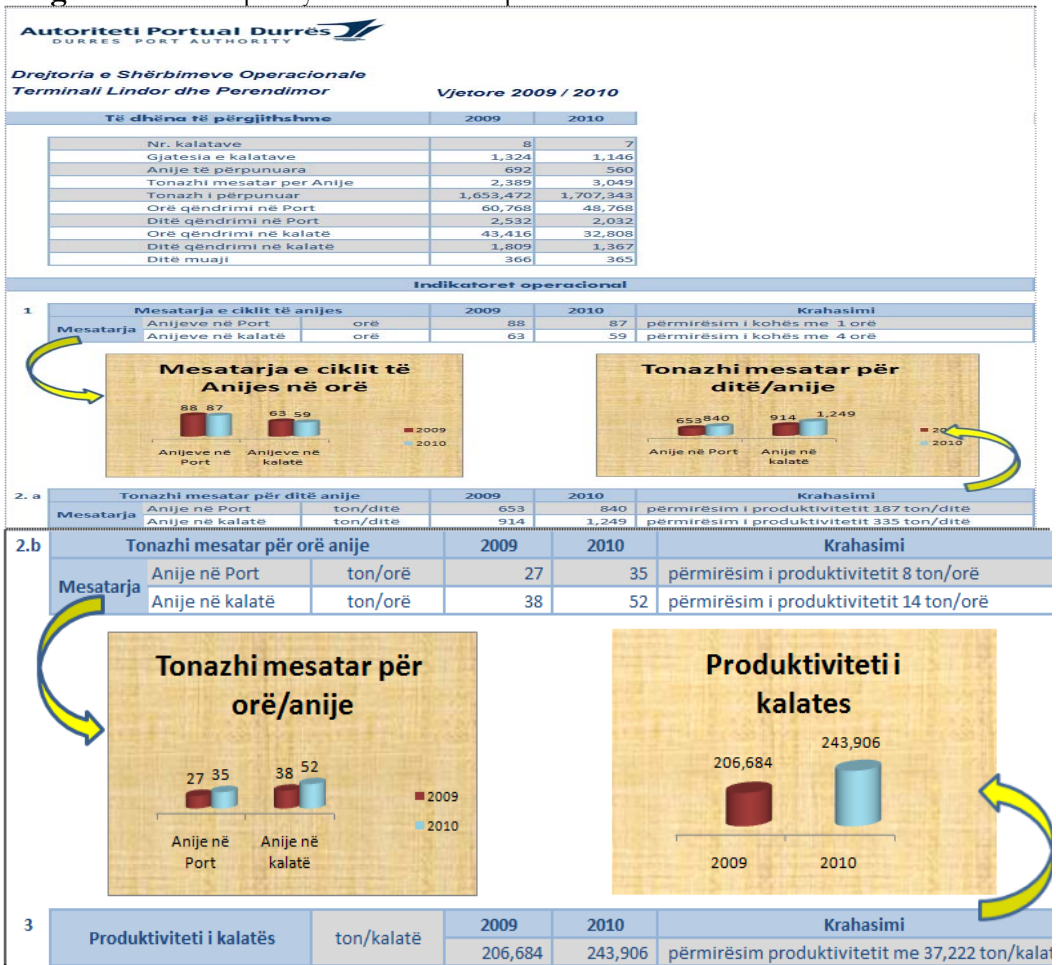
In order to calculate the berth occupancy rate (BOR) for the container terminal we can use the following formula:

$$BOR = \frac{[\sum \text{service time in port (hrs x meters used)}]}{\sum \text{available hours x meters}} \times 100$$

To calculate the labour utilization rate (LUR) we can use the following formula:

$$LUR = \frac{[\sum \text{service time in port (in hrs)} \times \text{workers}]}{\sum \text{available hours} \times \text{workers}} \times 100$$

Fig 3. Berth occupancy rate in Durres port terminals





Source: Durres Port Authority

According to the data provided by DPA, it can be noted that at the beginning of the terminal operation in 2002 when the number of cnts handled was less than 1000 TEU, the waiting time, berth occupancy was very high, making the terminal not competitive. The LUR was very low therefore the terminal was not efficient and effective. In 2010 comparing to 2009 (fig3) it can be seen that the BOR was more effective, thus improving the terminal performance. It can be noted from fig 3 that berth occupancy rate for a vessel in 2010 was cut down to almost 25% as a result of the improvement of port performance indicators. The improvement of port performance indicators was as a result of the port automation of operations.

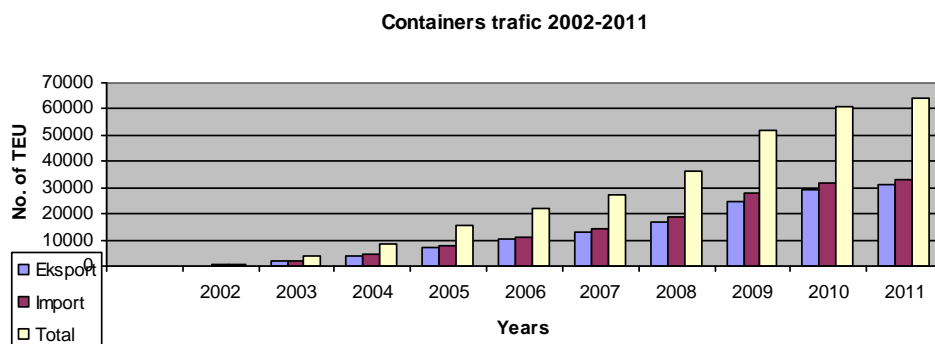
Table 1. The total tonnage and number of TEU handled in Durres Port Containers Terminal during period 2005-2010

Years	Export			Volume in Tonne Export	Import			Volume in Tonne Import	Total number of Boxes	TEU Total	Volume in Tonne
	Number		TEU		Number		TEU				
	20"	40"			20"	40"					
2005	4,482	1,457	7,396	16,970	4,640	1,625	7,890	130,471	12,204	15,286	147,441
2006	5,797	2,445	10,687	26,443	5,898	2,647	11,192	188,178	16,787	21,879	214,621
2007	8,054	3,965	15,984	69,423	8,647	4,248	17,143	287,751	24,914	33,127	357,174
2008	11,450	5,405	22,260	157,185	13,518	5,510	24,538	424,942	35,883	46,798	582,127
2009	17,714	8,356	34,426	293,631	16,782	8,707	34,196	504,125	51,559	68,622	797,756
2010	18,040	8,820	35,680	460,823	17,664	9,135	35,934	507,678	53,659	71,614	968,501
2011	8,376	5,632	19,640	215,792	8,486	5,167	18,820	277,058	27,661	38,460	492,850

V.O. Year 2011 is 6/Months

Source: APD

Chart 3. Containers traffic in Durres Port during period 2002 - 2011



As it can be seen from this chart there is a strong container traffic growth between 2008 and 2010 and in the last year we realize a lighter growth. The slow of the growth is as the result of the global crises effects in the Albanian market.

8. Conclusion and Recommendations

- It can be concluded that the optimization of the operations in container terminal is important, especially in the case of Durres where the terminal area is very limited and terminal expansion possibilities are restricted
- The container terminal management personnel should create a culture of performance measurement which will serve as the basis for further development of the terminal efficiency
- DPA, should get the port performance indicators right and periodically measure them in order to keep the port performance in satisfied level.
- It is demonstrated that container terminal In Durres port even though is a modest terminal, yet it need to be equipped with the automation of the operations.
- The three key variables of performance assessment, namely throughput, space utilization, and equipment utilization can improve significantly as a result of implementing appropriately selected automation technologies for container handling and storage operations at maritime terminals.

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