ITS components in the optimization and control of people and vehicles circulation at the Port of Santos

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Abstract: This paper presents the current status of the use of ITS components in the optimization and control of movement of persons and vehicles at the Port of Santos, explaining about the local characteristics, technologies used and how these components are assisting in the automation of a series of controls existing and designed in compliance with local laws.

Keywords: Port of Santos, ITS, Internal Revenue Service Brazil, Access Control, ISPS-Code, CODESP, ABTRA, BDCC, Mifare, RFID, Camera, Biometrics, Gate, Turnstile, SEP.

1. Introduction

The global economy was supported mainly by developing countries in recent years. Brazil is an important actor this scenario by its territorial extension, population and market. Ports are important instruments of economical and social development, requiring permanent measures to improve logistics. With approximately 8,500 km of navigable coastline [1] and vast territory, Brazil

needs to achieve integration of production, promote investment, create jobs and expand exports of goods and services. Thus, we must recognize the strategic importance of the Port Sector and act to solve their biggest problems, the famous logistic bottlenecks. The government has continuously encouraged the intensive use of technology to optimize, monitor and oversee all of this trade flow. This effort began with the Federal Law on Modernization of Ports (Law No. 8630 of 25 February 1993) [2] law which provoked significant changes in the olders, and admittedly precarious conditions of port logistics, opening operations to the initiative private, regulating the activities with the establishment of terminals for public use and private use, and has intensified since then with regulations, declaratory acts and ordinances of the Internal Revenue Service - Brazil - SRFB [3] and the *Special Secretariat for Ports* - SEP [4].

The Port of Santos has a special feature of this analysis to be the largest port in the southern hemisphere, with 12 kilometers in length [5] and more than 96 million tons of cargo handled per year [6], and perform complex and logistical operations costly involving millions of dollars. All this size and complexity pose an enormous challenge for the optimization of existing infrastructure, besides the risk that needs to be mitigated due to increasing in

importance worldwide in Brazil before big events like Soccer World Cup (2014) and Olympics (2016). ITS components represent the most effective solution to achieve those intentions. In this article we discuss the main components of ITS are being used today to consider this challenge and make that Brazil can meet these new needs continue to increase the ability to import and export cargo at the Port of Santos.

2. Scenario

With 281 km^2 [7] and approximately 419 000 habitants [7], the city of Santos is the richest and most important of the coast of São Paulo. The main economic activity is the port of Santos and both are fully integrated with their problems and benefits. The Port of Santos has a very characteristic geography, stretching for over 12km and is operated by several private companies are allowed to operate by the Internal Revenue Service of Brazil, through public bidding.

The region of Santos was among the first to be populated in Brazil, circa 1531, and has always used the port to transport goods. Its location in the channel of the estuary, is mainly due to the need for time to protect against pirates, looters and foreign

Fig 1 - View of Santos and the channel input port (Santos Estuary) - Source: Google

Fig2 - Major companies that operate and store loads in the Port of Santos Source: ABTRA [15]

invasions. The official inauguration in March of the Port of Santos occurred in 1892 with 260 m of quay [5]. He is currently the largest port in the southern hemisphere and annually moves more than 96 million tons of goods [6].

3. Problems Faced

Because it was planned and built for the needs of the time, the Port of Santos lacks a geographic planning in view of the current situation. Its great length makes it difficult to control, different activities (storage, spawning, transportation, etc.) occupy positions close to each other and a large contingent of individuals and vehicles accessing the port facilities daily for different purposes.
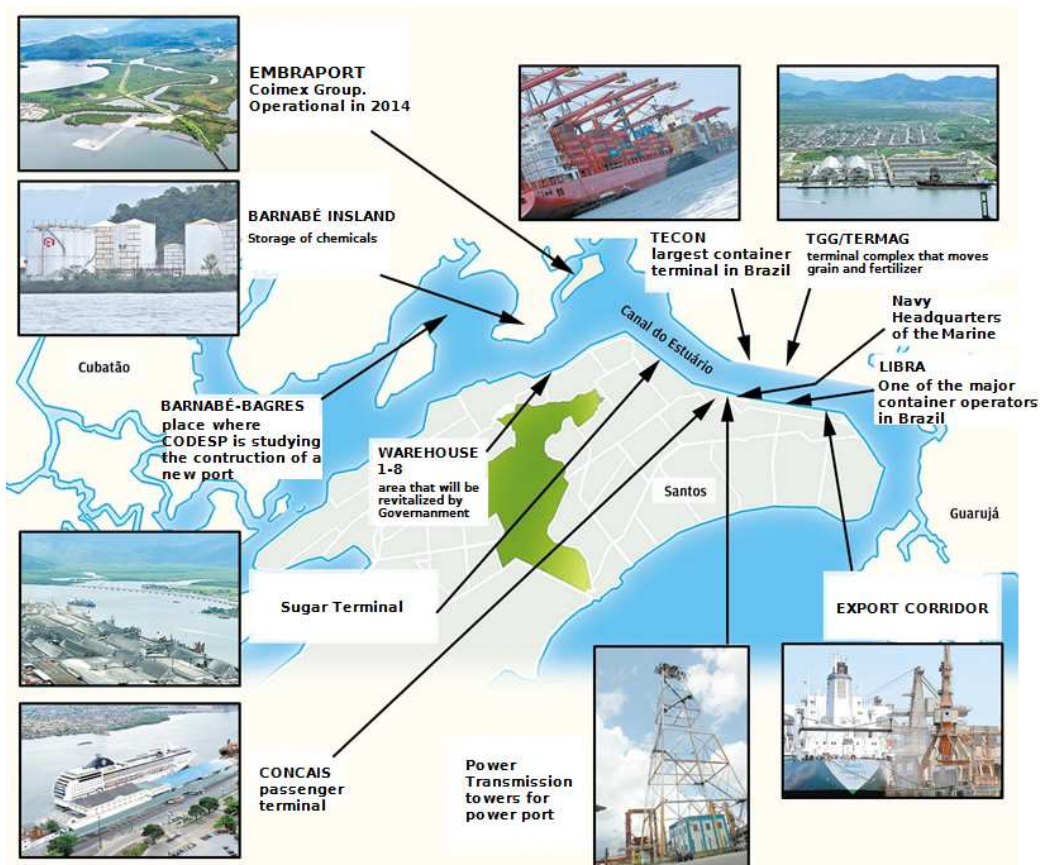

Fig 3 - Map with terminals' structure at the Port of Santos - Source: Simexweb [8]

Nowadays, individuals and vehicles accessing the customs areas are controlled by different access control systems, working separately and do not respond to any control policy. With this scenario, its impossible to obtain an official estimative of both quantity and reliable people and vehicles accessing the area, and the flow of movement as well. This information is essential for proper planning of the works of infrastructure, and provide the necessary data for control and enforcement actions.

Some initiatives are beginning to reverse these problems and will be explored in the next section.

4. ITS Systems and Used Components

The Dock Company of São Paulo (CODESP) [9] is a mixed capital company and was responsible for the certification process of the Port of Santos in the ISPS-Code [10]. The project was initiated with the development of a system (SSPP) [11] which aims to provide port authorities with the automated control of access of individuals and vehicles passing through the port areas, more accurately, the public gates controlled by CODESP . All accesses made to the port areas under their jurisdiction are allowed upon submission of an electronic badge access, using RFID technology standardized by ISO / IEC 14443 [12] and named MIFARE [13] (trademark NXP - Philips). The gates of access to areas were refurbished to new equipment identification were implanted with the following technologies employed:

- Ratchets with equipment to read MIFARE cards so that the data of individuals or vehicles that are accessing the port area are recorded and checked electronically to prevent access by individuals or unauthorized vehicles;
- Equipment biometrics to the individuals identifications is verified in order to ensure that the person presenting the badge is correct with valid data;
- Cameras for remote monitoring and recording of activities undertaken in GATES streamlining the application process for emergency personnel if necessary.

Because of limited scope, since it controls only the CODESP Gates that provide access to Public and Private Zone, and some flaws in the process of using the system, since the SSPP reads only the ID badge and this security MIFARE reading the ID card has already been broken, the Brazil Internal Revenue Service, specifically the Federal Revenue Customs Port of Santos, began collecting the terminals and bonded so that there was a more effective control of all customs areas under their jurisdiction. Thus, a new project was developed with the similar goal, but much more comprehensive, *Database Joint Accreditation* (BDCC) [14].

The *Database Joint Accreditation* (BDCC) is a system developed by the Brazilian Association of terminals and bonded warehouses (ABTRA) [15], under the guidance of teams of Customs Revenue Service of Brazil's Port of Santos, to establish an centralized data environment to confirm the identification of people and vehicles and for issuing electronic identification badge approved to be read in all locations and bonded warehouses of the Port of Santos and region. The BDCC was built in compliance with Ordinance No. 200 [16] Customs of the Internal Revenue Service of the Port of Santos, dated April 13, 2011.

The main difference between the system of BDCC - ABTRA for the Santos Customs service, the project SSPP CODESP, is the technology used by both systems, especially in regard to security, since the system BDCC have been developed based on attendance of 10 countermeasures disclosed by the patent owner of technology development Mifare, NXP, Philips subsidiary in Brazil, and its scope, since only the SSPP control Gates primary zones and control all BDCC Gates or local bonded, and they are the primary zone or secondary, currently being used in areas including special shipping cargo for export, called REDEX.

4.1. Advantages of Using New Systems and Components of ITS

The new ITS systems and components that are now being used at the Port of Santos are contributing to that security be increased, besides facilitating the implementation of public policies, due to the fact that increasing knowledge about the use of existing infrastructure.

Companies that are already integrated BDCC get through pre-authorization of federal revenue through the issuing of badges MIFARE, released

on their systems access control entry and exit of individuals and vehicles in advance, without the need to submit any other documentation. The only requirement of the companies responsible for customs areas is to register in their systems of control access the reason that person or vehicle has to enter the in the area.

Aiming to continue this progress and continuity of investment by tenants companies of the bonded terminals, the SRFB published in late 2010 Ordinance 2438 [17] which requires that all companies, to remain bonded, have automated processes for record entry truck and cargo through the identification plates and containers via OCR, and the identification of the containers contents via scanner, so as to optimize customs inspections and other consenting bodies.

5. Conclusion

As shown in this article, the quantity of people and vehicles that travel daily through the port of Santos is an immeasurable challenge for management and control and therefore control of these inputs and outputs could be made only through a technological process of identification through electronic badges. The ITS components and systems presented herein are part of the group of technologies that began to be employed at the Port of Santos, which has proved very efficient in control and optimization of existing infrastructure. New projects are beginning to be made using the Port of Santos ITS components with different approaches such as: identification of vehicle license plates using OCR, cargo tracking using electronic seals, cargo scanning for surveillance and control, etc. They all represent a new milestone in Brazilian logistics chain adding technologies already used in various parts of the world, and enables increased productivity and mitigate risks increasing and more difficult to detect in order to ensure we have an increasingly increase in Brazilian exports to safety, efficiency and effectiveness.

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