A Research of Optimization of Water-gate System Based on Three Bilateral Clearance Cooperation Policies at Container Terminal

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Keywords: Guangdong-Hong Kong-Macao Zone, Free Trade Area, Water-gate System, Container

Abstract. The following passage mainly focus on the knowledge of clearance cooperation at inland city and seaside city, as well as the achievement of administrative bilateral department exchange information. Based on the cooperative strategies of water-gate system optimization at container terminal, the department will not only recognize its supervision bilaterally, but also they are allowed to achieve a mutual law enforcement. Besides, the passage will also talk about the establishment of clearance cooperation of both cross-divisions and cross-region from both inland city and seaside city. Optimizing clearance procedure and identifying bilateral monitor result by standardizing internal supervision in the same division as well as enforcing the law in different branches, the government can push to a management institution which is not only appropriate to Chinese currency, but also it is competitive enough to meet globalization.

Introduction

Constructed in November, 2009, the bridge of Hong Kong-Zhuhai-Macao will be started to work in the end of 2017. With its length of 50 miles, across the sea nearly 35 miles, the bridge is located in the west of Hong Kong, in the east of both Zhuhai city and Macao. It is reported that the bridge will become the largest cross-sea bridge around the world by connecting new road system at Zhujiang River. Due to the bridge, it helps the Guangdong-Hong Kong-Macao Area develop more deeply. For example, the area will be developed by both eastern cities of Zhujiang River (Hong Kong-Shenzhen) as well as western cities of Zhujiang River (Hong Kong-Zhuhai-Macao and Hong Kong-Shenzhen). There is no doubt that it will bring a new situation to the Area.

With a development of international trade and opening up, as a core city of western side at Zhujiang River and a link of Hong Kong-Zhuhai-Macao bridge, the demand of container transportation in Zhuhai city will increase constantly. To a scientific extent, it will require higher quality to its supervision of law enforcement and operation. Thus, focused on the analysis of both water-gate system and artificial intelligence, the passage will make a research on how to avoid declaring and inspecting repeatedly. In order to develop throughput skill and fasten its speed for water-gate, the passage will also put forward some related policies to ensure its electronization.

1. Current Development in China

There is no doubt that the port construction in China still is remained in the early age so it is not suitable to make the use of AI port system designed by other countries. Because of different development times, different port management and different information standards, the data from every terminal vary that we find it hard to share bilaterally. What’s worse, repetitive construction make it harder to make connection with every terminal system when people decided to build up an information system, which cause some unnecessary waste for its materials and human costs. There are unstable efficiency of both collecting and upgrading information caused by different time of constructing the terminal, logistics company and yard. These problems often lead to lose data or synchronize its information wrongly, which will make a bad impact on dynamic supervision and cargo transportation efficiency because of unreasonable design and the technological rapidly development. [1]
Recently, there are three kinds of electronic water-gates in China. First is a virtual electronic water-gate. However, its physical facilities are not built up completely so that the joint inspection branch has to allow them to leave without paper according to electronic system and share its information to ventures managing the port. Finally, the cargo can be passed by searching electronic information permitted by venture at water-gate. Second, there is electronic water-gate exchanged by none-electronic information. This kind of water-gate is supported by outstanding physical facilities to promote its management, but it need to be managed by venture using allowance information in electronic system to let cargo pass. The third of electronic water-gate is half-automatic that it is linked to qualified equipments. However, not all the joint inspection branches choose to exchange its information so the permission of the water-gate needs to be controlled by checking documents.

The business of both submitting container and carrying container relies heavily on collected information such as truck number, container number and ponderation etc when it is worked at a traditional container terminal. Besides, the business is also required to record its data by hand and check the damage of container. Generally speaking, in order to fulfill responsibilities on their own, every joint inspection branch will dispatch their staff to monitor truck and cargo at water-gate by checking documents to let it pass. Unfortunately, this kind of activity requires a large number of employees, and because of the low correction of data, it leads to an inefficient passing directly.

2. The Main Technological Theory of AI Water-gate System

Regarding the modern construction of container terminal, it is one of important projects to be respected from all over the world, which main research is focused on automatic and artificial intelligent activity. In order to achieve the goal, an excellent activity procedure and system is needed while artificial intelligence depends on the development of system. With the development of modern technology, especially to the development of radio frequency identification, automatic identification of container number, electronic loadometer, computer, automatic control and the reduction of both software cost and hardware cost, the automatic water-gate system has a wide range of usage at container terminals. [2]

2.1 Radio Frequency Identification

As a new information technology, RFID has increased its using value constantly. [3] The key of logistics management is to guarantee its data collection in time and correctly, which remains a low cost technology to achieve data exchange quickly from wireless. However, the expectation from logistics system can not be met by current accuracy of data collection due to some factors like inefficient speared from air, environmental disturbance, movement, sign and direction of reader antenna etc. With these factors, the issue of reading rate could not be made solutions all the time. As for users, the return rate from APP depends on the reading rate of sign. Usually, finishing data collection has two methods consisted of fixed water-gate and handheld RFID Reader. In addition, the collection from fixed water-gate is more challenging than reader. [4]

2.2 Automatic Container Number Identification

Defined as container number identification, automatic container number identification is based on automatic identification from optical character recognition that can simulate human-identification and separate its container’s number and size with 5 directions. After judgment, it will request to make a comparison and choose a best container. The automatic water-gate system will be focused on analyzing its container’s number and size that be identified automatically as a basic data of transacting business, as well as making corrections to its data from terminal system, yard and truck reservation system. This can replace the manual input and process of checking data, so as to reduce manual mistakes and damage, which improve its passing efficiency.

2.3 Electronic Loadometer

As a main weighing-appliance, electronic loadometer is used with giant cargo included load bearing mechanism, high precision load cell and weighing display instrument etc.
2.4 Web Service System

As an independent, own-included and low coupled application, used to design distributed interoperable applications, Web service system can be used to opening extensible markup language to finish its description, accommodation and allocation. With the support of Web service, different application worked in different machines can be guaranteed to achieve an information exchange without any help by others. Water-gate system is not only an internal system at container terminal, but also it needs to exchange its data with custom system, business system from terminal and yard management system. Therefore, in order to share data in every system, automatic water-gate system needs to be supported by Web service. [5]

3. The Total Scheme of AI Water-gate

3.1 The Arrangement of Water-gate

As for water-gate passageway, it is constructed with electronic loadometer system, electronic license plate recognition system, IC card reader device, electronic lock and LED boot screen etc. It can collect the data from container and trucks. As for brake bars, the first brake bar in gate passageway is used to take photo of empty container and avoid following trucks. The second brake bar will fall controlled by electronic water-gate system by checking permission information after the truck passes the gate. In addition, in order to monitor trucks at gate in real time, it is also installed a HD surveillance camera to gather information about trucks and containers, so as to ensure the running of electronic gate.

3.2 The Declaration Procedure of both Shipping Bill and Cargo

According to electronic port shipping bill system, the shipping agency will send detailed electronic shipping bill information to joint inspection branch regarding its imported cargo, exported cargo and container. Then, the clients are able to make their declarations for cargos and container with the help of single window. As for the joint inspection, according to cargo declaration information and electronic shipping bill information, they are not only allowed to make inspection and check the cargo, but also they are allowed to make a checking order to terminal.

After receiving order, the terminal system will tend to make a transaction and manage machine operators to carry out ordered container into stipulated places to be check. Finally, the system will give an electronic information feedback to joint inspection branch after finishing activities. The branch is required to make an inspection to cargo and container, as well as permits qualified things to pass by electronic gate system and terminal.

3.3 The Procedure of both Submitting Container and Entering Gate

When the truck reaches terminal, it is required to go through office of submitting container. With the help of terminal working system, the employee at gate is allowed to gather the information of both truck and container into IC card. The driver is permitted to enter the gate to submit container eventually. It is allowed to collect internal data from IC card in the front end electronic gate system and make the use of camera to record trucks. The container number identification system is request to identify container number and make use of electronic loadometer system to record the truck’s ponderation data.

Collected from front end system, the electronic gate system is required to give a feedback to custom, terminal, electronic port platform and quarantine institution. When the gate bar is up as well as the LED is green, the truck is allowed to enter the gate. The information such as truck, container and weight will be launched in website and Wechat provided by terminal system, so as to make sure that the clients are allowed to get familiar with the container’s weight. This combines with SOLAS convention launched by IMO regarding to the relevant requirement of exported container VGM.
As for the machine operator at yard, they are required to carry container under the truck according to system order. Later, the information of container unloaded at yard will be sent to custom, electronic port platform and quarantine institution by terminal system.

3.4 The Procedure of Carrying out Container and Turning off Gate

Generally speaking, the client will go through terminal with bill of loading regarding to passing. The charging system at port is provided to compare container information with both permission from custom and quarantine information. After transaction, the system will be allowed to provide a prompt box of permission. If there are some permission orders provided by custom or quarantine institution, it will be continued to finish a payment.

Only after finishing above-mentioned procedures does the terminal working system can be allowed to release its locking status so that the truck can be gone through in the process of entering gate and carrying out the container. If the order is not provided, the locking will continue to work so the truck is not allowed to enter gate.

The trailer driver need to make IC card and handle procedure of both entering gate and carrying out container at gate office. According to terminal operating system, the gate worker is required to record information of vehicle and container into the IC card so that trailer driver is able to go on their carrying work with IC card. Machine operator at container yard carries on the container loading operation with the instruction of the wharf vehicle operation system.

3.5 The Identification of Electronic Closing Lock

The system can be supported to finish sealing function by wireless antenna, according to communication machine installed in the channel, the wireless data transmission system will be required to send the password to electronic lock. When the lock is met its sealing conditions, it will start to lock electronically. Once the wireless seal function (electronic lock function) has been finished it can not be opened generally once again. However, according to the wireless opening permission provided by antenna, the wireless data transmission system will be required to send the password to electronic lock. Electronic lock will be tended to check alarm and password, so as to confirm whether it is locked. Later, it will be needed to open its function of electronic lock as well as send the completed information to reader. It is regulated that only electronic lock has been finished does it opens.

The electronic lock data (mainly electronic lock number) will be registered in the background of the logistics monitoring system. In order to manage and verify whether the electronic lock is legal or not, when we prepare transportation planning document or customs declaration to target truck, it is also required to bound electronic lock at the same time. In addition, according to the customer algorithm, generating the password of electronic lock with 10 digits is vital.

4. Effect of Intelligent Gate System

With the support of paperless operation and regional integration clearance, enterprises can free from submitting documents that most of them no longer have to print paper declarations and accompanying documents in the more convenient declaration. Because of fast customs clearance platform, enterprise cost significantly reduced and the efficiency of customs clearance significantly enhance, which means that they are meeting the countdown era when they make declarations. At present, electronic gate daily clearance capacity can reach 960 trips, automatic release rate as high as 92%, paperless customs clearance rate of more than 95%.

After establishing the implementation of electronic clearance, each inspection declaration reduce 35 minutes for enterprise, the vehicle at the gate shortened to 10 seconds to pass, automatic release rate is 97%, which greatly enhances the clearance time of truck.

The procedure of optimizing inspection and quarantine clearance is needed to do it businesses for nearly 7000 batches every year. Each batch of goods to make clearance can be shortened the average time by 0.5-2 days, which save 50% cost for enterprises regarding to port declaration, inspection, warehousing etc. Each container every day needed to be paid 300 yuan while it can be
saved nearly 50 yuan after electronic water-gate was constructed that company can reduce 4 hours for every orders. It is reported that the gate is allowed to release nearly 92000 containers, which reduce 4600 thousand yuan for enterprise.

References


