

The estimation of the facility efficiency in Nansha Port terminal

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Abstract: This paper shows the investigation results of the Nansha Port on many parameters for calculation its facility efficiency. Based on this result, we find out the present capacity of this port is enough for further development.

1. Introduction

Nansha Port Area, which is located in Nansha District of Guangzhou City on the West Bank of the Pearl River, looks south to the South China Sea, east to Shenzhen, West to the South China Sea, Panyu and Shunde, is located in the geographic geometric center of the Pearl River Delta, covering the entire Pearl River Delta urban agglomeration including Hong Kong and Macao within 100 kilometers.[1-3] It is the bridgehead of Guangzhou's urban space South expansion strategy, the only way for Guangzhou-Foshan economic circle to lead to the sea and connect the Pearl River Delta. The hub of urban agglomeration and the preferred place for comprehensive cooperation between Guangdong, Hong Kong and Macao. At present, the port area is mainly composed of Shazai operation area, Xiaohu operation area, Luwan operation area and Nansha operation area. The Nansha operation area located in Longxue Island is the main container terminal location of the company. The plan of container terminal in Nansha Operating Area is shown in Fig 1.

In November 2018, the executive meeting of Guangzhou Municipal Government deliberated and adopted the Master Plan for Guangzhou Comprehensive Transportation Hub (2018-2035). The "Planning" puts forward the layout of the "dual-core" freight hub, in which the "Nansha core" is the core of Nansha Port Area, the strategic fulcrum of the Silk Road Economic Belt and the Marine Silk Road, the construction of a free trade port, and the promotion of the development of Guangdong, Hong Kong and Macao Bay Area. We should optimize the functional layout of the port area, focus on the construction of large specialized deep-water berths and sea-going waterways in Nansha Port Area, realize the gathering of port cargo transport functions to Nansha Port Area, improve the port dredging multimodal transport system, speed up the construction of Nansha Port Railway, promote sea-rail intermodal transport, and strengthen the planning and construction of inland waterless ports. Based on this, we need to get the correct information on the capacity of this port area. As it is very important to estimate the capacity of this port, we have to investigate in this port and gain much basic data to do the estimation.

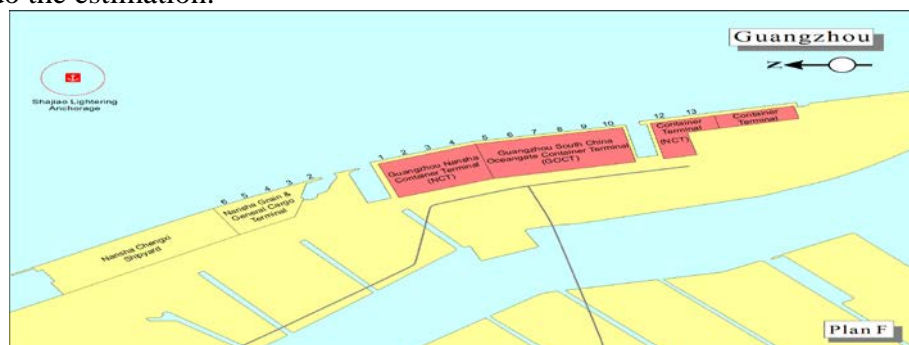


Fig. 1 outline of Nansha Port wharf

2. The basic parameter of the wharf

The dense water network of the Pearl River provides great convenience for water transportation in Nansha Port Area. The Pearl River accounts for 5 of the 28 key ports built by the state. After years of construction and development, the Pearl River system has formed a shipping system consisting of numerous waterways and ports. The natural resources in the middle and lower reaches of the Pearl River are relatively scarce. The development of the middle and lower reaches of the Pearl River is inseparable from the transportation of various raw materials and fuels. Through the Pearl River system, important materials such as phosphorus, aluminum and coal produced in Yunnan, Guangxi, Guizhou and other provinces in the upper reaches of the Pearl River in the Pan-Pearl River Delta are transported along the Pearl River waterway to the middle and lower reaches of the Pearl River. All kinds of mechanical equipment and electronic instruments needed for the development of tourist provinces have been continuously transported to their destinations. The Pearl River system has injected strong impetus into the sustained and rapid development of the whole regional economy. Low cost and large capacity are the most obvious advantages of waterway transportation. In terms of cost, the cost of transporting goods by water is only 1/6 of that by road and 1/4 of that by railway. In terms of transport volume, more than 10% of the total freight volume in the whole river basin is transported by water, and the proportion of imported coal, gasoline, grain and other important materials is more than 30%. In addition, water transport has the characteristics of low environmental pollution and sustainable development. In short, relying on dense water network, the Pearl River waterway transportation has brought into full play the advantages of large volume of waterway transportation, low energy consumption, low economic cost and low environmental cost, promoted regional economic development, accelerated industrial transfer and upgrading, and provided a strong impetus for the economic development of the Pan-Pearl River Delta region. Relevant government departments are aware of the many advantages of waterway transportation, especially its sustainable development can be compared with other modes of transportation. During the 13th Five-Year Plan period, they invested huge amounts of money and increased the construction of waterway infrastructure, which has made considerable progress in waterway transportation. In addition, the renovation and dredging of important waterways have been strengthened, and the waterway grade has been continuously upgraded. The renovation works of Zhaoqing-Hutianmen waterway and Liansharong waterway have been completed successively. After the completion of the project, Zhaoqing can be directly connected to 3,000-ton seagoing vessels.

At present, Nansha Port has 40 liner routes, and the top 20 liner companies in the world have also carried out container transport business here. Relying on the developed Pearl River system and strengthening business cooperation with small and medium-sized Wharfs in hinterland, Nansha Port Area has established business links with more than 20 feeding ports on both sides of the Pearl River. Through the shuttle bus opened in Guangzhou Port in July 2006, Nansha Port Area has built a water transport network to enhance the radiation driving capacity and reduce transport costs. The so-called "shuttle bus" refers to the use of barges to transport goods by water. Taking advantage of the dense water network in the Pearl River Delta region, barges are used as transport vehicles to shuttle between Nansha Port Area and various ports, thus realizing the distribution of cargo, improving the radiation capacity of ports, and becoming an important factor in the increase of container throughput of ports. The 150,000-ton container ships in Nansha Port Area can travel in two directions with 100,000-ton container ships, and the maximum reliable berthing capacity is 200,000-ton container ships. Nansha Port Container Terminal has a deepwater coastline of 5718 meters, 16 special berths for container ships and 61 ultra-Panamanian quayside cranes. The main equipment parameters of Nansha Port Area are shown in Table 1

Table 1 Basic Parameters of Nansha Port

	Period I	Period II	Period III
Shoreline (M)/berth	1,400/4	2,100/6	2,218/6
Barge shoreline (M)	500	880	880
Bridge crane	19	22	20
Portal crane	12	8	8
Shore water depth (M)	-14.5	-15.5	-17
Gate access (in + out)	12+12	12+8	12+6
Reactor Capacity (TEU)/Area (Hectare)	86,373/182	151,892/223	120,000/180

The first, second and third periods of Nansha Port are non-automated wharfs, and the fourth phase will be built into automated wharfs. At present, there are 14,000 standard boxes for the main ship types on the East-West route in Europe and America, and the largest one has reached 22,000 standard boxes. Since its operation in 2004, Nansha Port Container Terminal has built 16 special berths for containers in three phases, of which 4 berths of 150,000 tons are distributed along Longxue Island, which takes over 70% of the container operations in Guangzhou Port. At present, the total land area of the wharf is 182,000 square meters, the depth of the land area is 1,300 meters, the length of the main shoreline is 5,718 meters, the berth of barge is 2,730 meters, and the depth of the front water is 15.5-17 meters. In terms of routes, 132 international and domestic routes have been opened, and container throughput of 15.66 million standard boxes was achieved in 2018.

Warehouse Facilities

The construction of storage facilities in Nansha Port can be divided into three periods. With the advancement of the construction process, the storage facilities are gradually improved.

Nansha Phase I: 1 300 m land depth, 1.08 million square meters of yard area, 145,000 standard boxes of yard capacity.

Nansha Phase II: Storage area 716528 square meters, warehouse area 54360 square meters, freight station area 21200 square meters, yard capacity 151892 standard boxes, 4968 refrigeration box sockets, 18 gate passages.

Nansha Phase III: land depth 1177 meters, land area 2.38 million square meters, yard capacity 106470 standard boxes.

Situation of Operating Equipment

Nansha Phase I: 19 quayside bridges of super Panamanian type, 60 gantry cranes, 12 multi-purpose gantry cranes and more than 200 other mobile machinery and equipment.

Nansha Phase II: 22 quayside bridges, 64 gantry cranes, 6 frontal cranes, 17 forklifts, 12 stackers, 164 trailers and 8 multi-purpose gantry cranes.

Nansha Phase III: 20 pc*48 tons quayside bridge, 60 pc*41 tons gantry crane, 8 multi-purpose gantry cranes.

By the end of 2017, Guangzhou Port Group Co., Ltd. has four ports, namely, Inner Port, Huangpu, Xinsha and Nansha, with 115 kilometers of sea-going channel, 179 productive berths and a total length of 25,338 meters, of which 66 berths are above 10,000 tons, 23 floating berths are above 10,000 tons, 11 of which are 10,000 tons, and 21 productive berths (their total length is 25,338 meters). The largest anchorage capacity is 300,000 tons; the annual cargo capacity of Hong Kong is 320 million tons. There are 1308 loading and unloading machines and 8 locomotives with a total assets of 33.2 billion yuan.

Marine equipment

Nansha Port has a total area of 223 hectares, with 6 berths of 150,000 tons, a length of 2100 meters, a depth of 15.5 meters, a width of 250 meters, a length of 35 nautical miles and a width of 600 meters. It can satisfy the berthing operation of the largest container ship in the world. In 2014, the world's largest container ship, Zhonghai Universal, with a load of 19100TEU, Medimaski 3E type 18000TEU, docked with Nansha Harbor Company successively, marking that the handling capacity of Nansha Harbor has reached the world's top level. Nansha Harbour, which operates Dafei Mozambique with 43 MPH bridge efficiency and Dafei Carmen with 49.2 MPH bridge efficiency,

ranked first in the global port bridge efficiency rankings in the 48th week of 2012, 18th week of 2013, and the Maersk Route with 108.1% berthing efficiency in 2014, out of 13 ports in the Far East. No. 2.

Table 2 Efficiency evaluation result

Unit name	Average Ship Time Discharge (TEU/hour)	Average Bridge Hanger Time Discharge (TEU/hour)	Number of ships arriving at port (vessel)	Average Stay Time of Box (day)
Guangzhou Port Nansha Port Co., Ltd.	161.2	37.1	18884	-
Guangzhou Nansha Seaport Container Terminal Co., Ltd.	102.5	30.34	19696	8.475

3. Conclusion

Nansha Port Railway is located in the south-central coastal area of Guangdong Province. It passes through Heshan, Jiangmen, Shunde, Zhongshan, Guangzhou Nansha and other economically developed areas. It connects with the existing Guangzhou-Zhuhai Railway in the west, and jointly constitutes the Western freight passage of the Pearl River Delta. It is an important part of the Western freight passage of the Pearl River Delta. It can effectively expand the port. It is of great practical significance to promote regional gathering and distribution and the development of port-vicinity industries, and to realize the historical mission of the national Nansha Free Trade New Area to "connect Hong Kong and Macao, serve the mainland and face the world, build a platform for Guangdong's opening to the outside world, and build a strategic hub for the 21st century's Maritime Silk Road". However, the railway line of Nansha Port is still under construction. After completion, it will be directly connected to the national railway network. It is expected to be completed and put into operation by 2020. Railway dredging port depends on Trailer barge transport a distance of one to two kilometers to reach the railway station or marshalling station, and then railway transport. Although the railway line directly into the port will facilitate the sea-rail intermodal transport, it will inevitably cause other modes of transport in the port to be blocked, which will affect the transport efficiency.

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