

# Study on Container Maintenance Cost Control in Shanghai Region

Dapeng Sun<sup>1</sup>

<sup>1</sup> Department of Container Management, Cosco Shipping Lines Company Limited, China.

**Abstract:** To advocate for environmental protection and cost savings, it's crucial to continuously innovate in container and refrigeration unit maintenance. This innovation aims to enhance efficiency and quality, reduce costs, and extend container lifespans. Over the past two years, thanks to effective domestic epidemic prevention, the domestic shipping market has flourished. Shipping companies have not only leased a large number of new containers but have also continued leasing used containers beyond their expected return dates. As these containers have been in use for 1-2 years, significant damage has started to appear. Concurrently, as congestion at foreign ports began to subside, a substantial volume of damaged containers piled up at docks was transported back to China, placing immense repair pressure on the country. With Shanghai being the largest port, the volume of repairs required has surged. During this time, it has become even more essential to examine the weaknesses and flaws in production and operation, focus on details, and control every critical cost point.

**Keywords.** Shanghai Port; Renewal of used returned containers; Return standard; Third party inspection company; Return empty containers; Return empty containers third party claim

## INTRODUCTION

The economic hinterland of Shanghai port mainly includes southern Zhejiang, northern Jiangsu, Anhui, Jiangxi, Hubei, Hunan, Sichuan and other provinces. Port goods flow to the hinterland: including Zhejiang, Jiangsu, Anhui, Jiangxi, Hubei, Hunan, Sichuan, Fujian, Henan, Shaanxi, Qinghai, Gansu, Ningxia and Xinjiang.

On January 1, 2022, the container throughput of Shanghai Port has exceeded 47 million TEUs, holding the position of the world's largest container port for 12 consecutive years.

On September 8, 2022, the single day and night throughput of the Port of Shanghai was fixed at 160058TEU, breaking the historical record created a year ago [Li, *et. al.*, 2023].

Shanghai Yangshan Port Zone Terminal Phase IV is an important symbol of China's economic integration into the global economy, and it will further promote China's trade and investment liberalization and facilitation. (Comments by Li Keqiang, then Member of the Standing Committee of the Political Bureau of the CPC Central Committee)

The opening of the fourth phase of Yangshan deep-water Port Area will play a very important role in expanding the container handling capacity of Shanghai Port, consolidating and upgrading the status of Shanghai Port as an international hub, and promoting the construction of Shanghai international shipping center [Ding, *et. al.*, 2022].

With the development of global free trade, safe, economic and fast container transport has been widely used in various fields of transport, and containers are also used as the main means of

transport for international trade. Container maintenance is also accompanied by the promotion and use of containers. The container maintenance cost is a very important cost item in the container fixed cost, and occupies a large proportion in the container management cost.

Since the global COVID-19 epidemic in 2019, under the circumstances of continuous outbreak of foreign epidemics and the basic paralysis of foreign factories, domestic epidemic control measures were effective. The factories can operate normally, global orders have been further concentrated in China, and China's export volume has surged. Under the double stimulus of a huge increase in ocean export trade and the paralysis of foreign terminals, empty containers cannot be returned, and the domestic container stock was insufficient. In order to protect exports, COSCO Shipping took the lead, and other liner companies followed, purchasing and leasing a large number of new containers, and renewing the expired used containers, and even renting back the used containers that have been returned [Wan, *et. al.*, 2021].

With the use of the new container for about 2-3 years, a variety of major repairs began to occur gradually; The used containers that starts to rent or renew is itself a time period that begins to incur large repair costs; There are foreign ports gradually dredged, backlog of damaged containers have been returned to the country. Under the superposition of these three factors, the total domestic repair cost and single container repair cost show a double increase. In this case, how to control the repair cost is particularly important, and with the increase of the base, the benefits obtained through savings will also increase.

## **LEAN MANAGEMENT OF PROCESS CONTROL**

Ordinary standardized repairs still occupy the vast majority of daily repairs. Although the repair cost savings per case may not be very large, over time, under the accumulation of the huge total amount of repairs, the savings will be considerable. Develop each repair process and each link, and strive to give each container accurate positioning and repair strategy through efficient and fine differentiation [Xu, et. al., 2023].

I. Establish a strict and efficient inspection mechanism. When empty containers enter the yard, they are inspected strictly, carefully and comprehensively, which is convenient for the separation and stacking of good and damaged containers, reduces the number of movement and reduces the cost of movement in the yard. It is also conducive to timely repair and improve repair efficiency; and make the empty container on the spot inspection, clear responsibility, to facilitate the third party claims to carry out collection work.

II. Distinguish the container condition level, grade A ,food container, domestic trade container or foreign trade container, distinguish the next input direction according to the container condition level, and formulate the most reasonable repair plan according to the corresponding standard for different input directions, that is, prevent low and high allocation and increase the current repair cost; It also avoids high-grade and low distribution, resulting in sharp deterioration of container condition and increasing future repair costs.

III. Make full use of the advantages of 5G network, adopt the offline + online method, increase the inspection frequency, improve the inspection intensity, and further strengthen the on-site spot inspection work. To overcome many difficulties, KPI inspection is carried out in the port and out of the port. KPI inspection items should be updated in time according to the completion of suppliers, and the target should be continuously optimized. Among them, it is necessary to regularly check the material library of the supplier, and urge it to ensure the supply of raw materials during the closure of the epidemic, so as not to cause the repair stagnation due to the lack of raw materials, resulting in an increase in the cost of container stay; It is also necessary to ensure the "fresh quality" of the material, reduce the degree of oxidation of the material before use, and strictly check the use of zinc-rich primer, so that although the single repair cost is not reduced, it can effectively extend the quality guarantee time of each repair, improve the repair quality, and extend the suitable use time of the container after a single repair, thereby indirectly reducing the repair cost.

IV. In the case of sufficient containers, the containers with high costs should be strictly screened, and those who meet the conditions of preferential off-

hire should be given priority to apply for off-hire (outside the normal off-hire arrangement), and some cases that are close to the renunciation period can even wait for off-hire.

V. Keep close contact with the container management of the storage yard. Strictly implement the first in first out policy to shorten the storage time of damaged containers. Speed up container turnover and improve efficiency. Grasp the repair rhythm of the container, in the public storage yard, ensure that the repair time of the container is priority, the repair intensity is higher than the average level, and the repair time is shortened.

## **TO REPAIR THE REEFER CONTAINER PARTS INSTEAD OF REPLACEMENT**

The export volume of reefer containers in Shanghai is relatively small compared with the total export volume, and the maintenance capability of reefer containers is not strong. After the spare parts of the reefer machine are damaged, under the previous operation mode, they can basically only be replaced. The reason is that many of them are imported spare parts, the price is high, the customs clearance process is not smooth during the epidemic period, and the additional waiting period is required. Using this opportunity to learn from the experience of an advanced port, the compressor, computer board and other vulnerable reefer container spare parts changed to repair, to ensure the quality of spare parts, while greatly reducing the cost of spare parts. At the same time, it is studied to replace the imported spare parts with domestic spare parts, and further develop spare parts independently.

## **RETURNED CONTAINER REFINEMENT, REPAIR CLASSIFICATION**

I. Strengthen the training and supervision of QC personnel in each repair firm, and maintain close contact and communication with third-party container inspectors, so that they always "care about the ship owner".

II. Arrange "repair before off-hire" in the own storage yard. The owner's own rate is generally much lower than the rent-out rate, so it is necessary to mobilize the lean force of the own yard for pre-rent-out repair to prevent secondary repair after rent-out.

III. Make full use of the common storage yard used by the leasing company and arrange direct return. Arrange in advance through the return container number section, so that the return container can be transported directly from the port to the corresponding return station, or the full return container can be arranged for the truck fleet to return directly to the corresponding return station. Compared with shipping to the owner's own storage yard and then to the rent-out storage yard, it avoids

one time of lifting and dropping and two stages of land transportation, which not only saves land freight and lifting costs, but also reduces the possibility of damage to containers. After the return container enters, the return number applied in advance can be transferred directly from the return station system, saving a lot of storage fees and rent. At the same time, because the yard has signed the agreement with the ship owner and the container owner, the ship owner's rate can also be used to save repair costs.

The repair process of the return container is complex, even if it can be distinguished from its return on the entrance. It needs to be moved down at least three times. It is necessary to make an appointment with international UNICON inspectors and wait for them to come for detailed inspection before and after repair. The average repair time is more than 8 days, according to the calculation, each returned container can save 8 days of rental costs and storage fees.

IV. In the case that the above two conditions are not met, the external return yard with a large return volume is selected for negotiation. In order to guarantee the return volume, an agreement is specially signed to become the agreement yard. And the agreement yard can use the owner's repair rate, which can effectively save the repair cost of the returned container compared with the return rate of the leasing company.

V. For the absolute external rent-out storage yard, once the cost exceeds the standard, a third-party inspection agency is arranged for inspection.

(1) Strictly control the high cost container, improve the third-party cut rate to reduce costs.

(2) In the case of a large number of returned containers, big amount of containers need to be shifted in order to cooperate with third-party inspection. So we can negotiate to apply for not arranging a third-party inspection under the condition of giving our company a discount. And then discount payment is made after direct approval by our staff.

#### **STRENGTHEN THIRD-PARTY CLAIMS**

On the basis of not affecting customer recognition, we increased efforts to collect third-party liability compensation in full, reducing fixed costs.

I. Strengthen the level of personnel for the inspection of containers in the storage yard, strictly inspect the empty containers in gate, especially the containers are returned by the customers. For damaged, contaminated and other places that need to be repaired and cleaned, on-site photos should be taken and archived.

II. Improve equipment level of the yard, such as the inspection bridge at the gate, so the top of the container can be checked; The site container inspection rack should be sufficient, and all the suspected problems with the floor and bottom

structure should be arranged to inspect the bottom. A lot of minor damage at the bottom of the floor is difficult to find only from the upper part of the floor. According to the current data comparison of different conditions in the area, as long as the inspection rack is sufficient, the floor claim rate can be increased by about 20 percentage points.

III. Input the empty container repair quotation into the computer system every day. Put it on the same footing as the collection of demurrage fees.

Centralized charging information and improve charging efficiency.

IV. The operation mode of "Terminal inspection - repair fee input - expenses collection - technical question answering - extended service". Through the exploration, practice and innovation of the colleagues of the container management, we continuously improved the service and optimized the business process, and finally determined the practical and effective operation mode. Although it is difficult to face the customer's incomprehension when answering questions, the technical staff is strict with themselves, with excellent business quality, good attitude and gentle attitude, and has obtained the understanding of most customers and guaranteed the recovery rate of third-party claims.

#### **CONCLUSION**

Through the above measures, the container repair cost can be significantly and effectively reduced directly and indirectly without reducing the repair quality. Thus, it can save a lot of costs for the shipping company in the case of the downturn of the shipping market. Each of these cost savings will be fully converted into the profit of the shipping company. It can be said that the implementation of these new processes and measures will continue to produce benefits. Moreover, it can also play a demonstration and continuous improvement effect in the actual production environment. The shipping market is changeable, and it is necessary to timely adjust and formulate new countermeasures according to new problems every year, so as to continuously optimize the procedure and save every bit of cost as much as possible.

#### **REFERENCES**

- Ding Y, Chen K, Wei X, et al. A novel cost-management system for container terminals using a time-driven Activity-Based Costing approach [J]. *Ocean & Coastal Management*, 2022, 217: 106011.
- Li L, Du W, Ma X, et al. A model for investigating the coordination between low carbon and resilience performance in container terminals [J]. *Ocean & Coastal Management*, 2023, 240: 106617.
- Wan Z, Zhang T, Sha M, et al. Evaluation of emission reduction strategies for berthing containerships: A case

study of the Shekou Container Terminal [J]. *Journal of Cleaner Production*, 2021, 299: 126820.

Xu B, Wang H, Li J. Evaluation of operation cost and energy consumption of ports: Comparative study on

different container terminal layouts [J]. *Simulation Modelling Practice and Theory*, 2023, 127: 102792