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Benefit Analysis and Evaluation of Yangsi Wharf Project

Junqiang Xue[1, a]

[1]Shanghai maritime university, Shanghai 201306, China.

[a]1049278468@qq.com

Abstract

The improvement of pilotage efficiency can greatly reduce the waiting time of incoming ships, and thus improve the on-time rate of container liner.It is a top priority for liner companies to ensure the on-time delivery rate and control operating costs.Through the improvement of pilotage efficiency, not only the operation cost can be effectively reduced, but also the utilization rate of the terminal can be maximized and the arrival rate of container liner can be improved.This paper analyzes and evaluates the benefits of yangsi wharf project from two aspects of economic benefits and social benefits. Finally, it comes to the conclusion that by improving pilotage function, the economic benefits of shipping enterprises can be improved by about 28,906,400 yuan/year.

Keywords

Pilotage efficiency improvement ;Economic benefit analysis; Social benefit analysis.

1. Introduction

The ascension of the pilot phase iv efficiency reduces the waiting for berth port the ship may cause shipment delay, to ensure the smooth regional transit and alleviate the subsequent ports and road congestion, not only to avoid the port and shipping enterprises economic losses, at the same time, also improved the route integrity, an enhanced the core competitive capacity of the port, strengthened the yangshan deep-water port as the status of the container hub port in northeast China, the yangshan deep-water port on the premise of not increase the size of the construction obtained a bigger development space, achieve the comprehensive benefits of many sided, for the road traffic, indirectly reduce the road traffic accident, to ensure the smooth road.

2. Economic Benefit Evaluation and Analysis

2.1. Benefit Analysis of Port Production

For ports, timely berthing of unloading ships will affect the waiting time for berths before entering the port, which requires timely berthing of unloading ships for unloading work, so as to ensure the balance of port production, ensure normal production order and effectively use production resources.In recent years, due to the adjustment of shipping routes in the surrounding waters, the proportion of yangshan port undertaking the work of the entire Shanghai port has gradually increased, and its production pressure has also continued to increase.Therefore, the capacity of yangshan port to deal with shipping delays and overstocking of goods is greatly reduced.According to the actual investigation, if the unloading ship can berthing in time when the tide is coming, and avoid the next tidal berthing due to missing the berthing time, the production progress of the port will be in normal state for about 3 days after that.

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2.2. Benefit Analysis of Port Handling Capacity

Before the implementation of pilot efficiency improvement of y4 phase, incoming vessels shall arrive at y4 phase from Y5 buoy through channel after the berth is free, and each delay time is about 2 hours.After the pilotage efficiency is improved, mooring operations can be carried out at berth 1, 2 and 3 under rising water conditions, which means about 21.4% of the ships entering the port can save 2 hours of waiting time.Under the condition of falling water, all the seven berths can realize intra-port rendezvous, which means about 50% of incoming ships can save 1.5 hours of waiting time.According to the designed container throughput of 4 million TEU of yangsi phase, the port's handling capacity can be increased by about (2×0.214+1.5×0.500) ×400÷24= 196,000 TEU through the improvement of pilotage efficiency.

2.3. Benefit Analysis of Feeder Transit and Follow-Up Port Work

Yangshan deepwater port is designed to be an international container hub port by virtue of its favorable water depth and geographical location.As an important transit port on international routes, it undertakes a large number of international and domestic cargo transfer tasks.At present, the proportion of transfer tasks in yangshan deep-water port is basically the same as that on land.

If the yang-iv mainline ships berthing within the stipulated time, it will be beneficial for yangshan port to have a positive impact on all feeder ports in the hinterland, and avoid overstocking of cargo at feeder ports, thus bringing indirect economic benefits.Unblocked land routes will reduce the burden of roads and urban roads and reduce social costs.

If the large trunk container ships of yangsi phase berthed on time, the efficiency of loading and unloading operation in the port area would be guaranteed, which is conducive to maintaining the normal operation rhythm of feeder ships, and the guaranteed operation period of feeder ships will have a positive impact on feeder shipping enterprises and subsequent feeder ports.The indirect economic benefit that this kind of chain effect brings is very considerable also.

3. Contribution of Economic Benefits of Surrounding Enterprises

The contribution of timely berthing of unloading ships to the economic benefits of surrounding shipping enterprises comes directly from the reduction of ship waiting time cost, while the indirect contribution comes from the enhancement of attraction of cargo flow, reduction of fuel consumption and improvement of utilization rate of transit space.

3.1. Direct Economic Benefit Analysis

The economic benefit of reducing ship waiting time can be quantified by the cost of ship time.

3.1.1. Time Cost of the Ship

Through field research, the actual data of container ship type cost of liner shipping company are counted, and linear regression analysis is carried out on the above data: the linear regression equation is obtained as follows: y=814.29x+414.29;R2 = 0.9868.Where, the fitting degree R2 represents the reliability of the measured data obtained by the equation. The closer the result is to 1, the higher the reliability is.Therefore, it can be concluded that the relationship between ship type and average cost satisfies the regression equation.

The average operating cost of all ship types calculated by the above regression equation is shown in figure 2-1.

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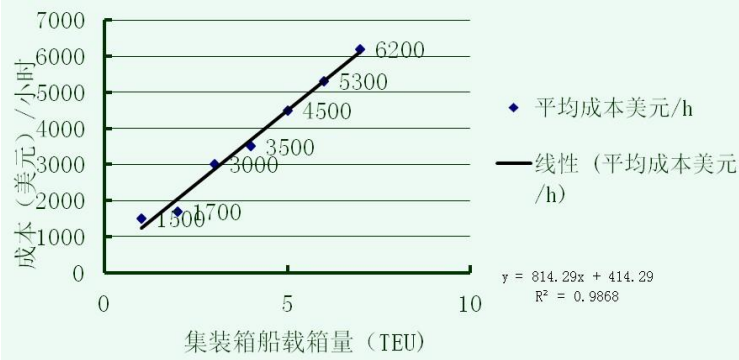

Fig 1. Changes of ship type and time cost

The average operating cost of all ship types calculated by the above regression equation is shown in table 2-1.

Table 1. Various ship types and time cost of a single ship

Ship type (TEU)	Average time cost per shipCi (Dollar/h)
<1500	1229
1500~2500	1500
2500~4000	1700
4000~6500	3000
6500~8500	3500
8500~10000	4500
10000~13000	5300
13000~14500	6929
14500~16000	7743
16000~18000	8557

3.1.2. Establishment of Economic Benefit Model

The economic benefit model built here can be used to calculate the loss caused by the long waiting time of ships entering port, so the model can also be used to calculate the economic benefit brought by the improvement of pilotage efficiency of yao4.Through a series of analysis, it is concluded that the factors that affect the economic benefit of pilot efficiency improvement of yao4 phase include: pilot efficiency improvement reduces vessels' waiting times in a year, and each saving waiting timeTime, etc., are taken into account as parameters of the model.Set:

Ψ—- Economic benefits of ocean iv pilotage efficiency improvement (usd/year);

n—- Pilotage efficiency improvement reduces the number of ships waiting for berthing;

β—- Each mooring mooring reduces the waiting time of the ship;

Si—-- Weighting factors of different ship types;

Ci—-- Average hourly cost of different ship types

Then the economic benefit model: $\Psi = n \times \beta \times \sum_{i=1}^{3} S_i\, C_i$

3.1.3. Calculation and Analysis of Economic Benefits of Reducing Ship Waiting

The four phase of the project feasibility study report analyzed the yangshan port to port ship status quo and development trend of world container ship, combined with the four phase of yangshan port throughput prediction and traffic flow forecast, at the same time consider as Shanghai international shipping center yangshan port container deep water port to accommodate ocean-going liner is given priority to factors such as the main line, so the forecast result of affiliated yangshan port area phase iv container berth alongside the ocean container

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ship type points there are three main types: 5 -, seven -, 10 -, its proportion is now 0:10 number.According to the conclusion of berthing type demand analysis, the main dimensions of the ship type designed for the fourth phase of yangshan port are shown in table 2-2.

Table 2. The design of the fourth phase of yangshan port area represents the main dimensions of ship type

DWT(t)	TEU	Si	Average cost of ship typeCi (Dollar/h)
50000	3501~5650TEU	0.3	1700
70000	5651~630TEU	0.6	3000
100000	6631~9500TEU	0.1	3500

According to the statistical results of the traffic flow measured in yangshan port area, the number of ships berthed in the fourth phase of yangshan port within 72 hours is 15 (the data of cargo ship with a captain of more than 100m).Before the improvement of pilotage function, vessels berthing in the fourth phase should sail from Y5 buoy to berthing in the fourth phase after the berth is empty. The sailing time is about 2 hours, that is, the waiting time of each mooring can be calculated as 2 hours.After the pilotage efficiency is improved, berth 1#, 2# and 3# berths can be nested under the condition of rising water, that is, about 21.4% of the incoming ships can be nested after the pilotage efficiency is improved, reducing the waiting time by 2 hours.The in-port rendezvous is realized under the condition of falling water, that is, 50% of ships save 1.5 hours of waiting time.Calculated according to the annual operation days of 300 days, the number of times of mooring vessels in the year after the improvement of pilotage efficiency n1=321 (all times);The annual number of vessels in port rendezvous n2=750 (ships).

According to the composition of the expected container capacity at the port, the average hourly cost per ship can be calculated by table 2-3.

Table 3. Average hourly cost per ship

i	DWT(t)	TEU	Si	Ci/h	SiCi	ΣSiCi
1	50000	3501~5650TEU	0.3	1700	510	2660
2	70000	5651~6630TEU	0.6	3000	1800	
3	100000	6631~9500TEU	0.1	3500	350	

After generation into the data, they get Ψ = n * beta * ∑ 3 sici = 321 * 2 * 2660 + 750 * 1.5 * 2660 = 4700220 (us $).According to the results of calculation analysis, you can see the economic benefit valuation Ψ approximately $4.7002 million, according to China's foreign exchange administration on recently central parity rate $6.15 to conversion, the equivalent of 28.9064 million yuan.

Therefore, based on the current data, the conclusion is drawn that the improvement of pilotage function of all incoming ships in yangxi phase can help shipping enterprises to realize the economic benefit improvement of about RMB 28.9064 million/year.

3.2. Indirect Economic Benefit Evaluation

Before the improvement of pilotage efficiency, ships entering the port need to enter the port through the channel after the berth is free. Therefore, when the delay of unloading ships in Hong Kong affects the work of follow-up ships, shipping companies often take measures such as speeding up the sailing schedule or canceling the docking to ensure the follow-up schedule.Therefore, for liner shipping enterprises, pilotage efficiency can improve the contribution benefits, including avoiding the wasted shipping schedule that cannot be timely

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landed and departed from the dock, as well as management troubles and a large number of indirect losses caused by the failure to operate according to the shipping schedule, which mainly reduces the loss of cargo volume and operating costs.The savings in operating costs can be quantified by calculating the increase in fuel costs associated with faster flight times.But the amount of lost goods avoided is harder to estimate.

(1) avoid the cost saved by accelerating the deadlineFor liner companies pursuing reputation and service quality, they usually increase the speed to catch up with the schedule to maintain reputation and service quality, but this method is very costly.

According to the navy constant formula, the relationship between the ship's power and its speed is P=(Δ^(2 age3) V^3)/C (P: engine power;: ship displacement;V: ship speed;C: navy constant).According to the formula, the power output of the propeller, that is, the power, is related to the ship's speed approximately to the third power.Fuel oil supports the ship's power output. When the ship speed increases, the ship's power output increases, resulting in the increase of fuel consumption.

(2) contribution to other indirect economic benefitsFor liner companies whose vessels need to enter the port through the channel after the berth is free before the improvement of pilotage efficiency, timely arrival and berthing of vessels can not only avoid the thorny problems in the scheduling organization, but also have a beneficial impact on all aspects of the daily management of the company

The on-time berthing of the incoming ships avoids the delay of the shipping date, ensures the scheduled docking of the ships, avoids the lengthening of the container turnover period, ensures the reasonable allocation of containers, avoids the difficulty of transferring containers in some areas or the extension of the lease period, and reduces the operation cost of containers.ensure the normal coordination and cooperation between alliance partnersIn addition to ensuring the scheduled berthing of ships at Hong Kong and downstream ports, it also avoids claims and disputes between shipping companies that share shipping space due to the fact that shipping space cannot be obtained in time or transit space cannot be utilized.

(3) to avoid the owner of the delay compensationFor liner companies that have special service agreements with shippers, timely arrival and berthing of ships can avoid compensation for the loss of shippers' time due to delayed delivery.(4) avoid the extra cost caused by missing the transit timeThe delay of shipment has a great impact on the transfer of goods.Many liner companies have transshipment ports as route relay. For example, many Mediterranean shipping lines currently transship in Singapore. If the ship is delayed at the front port, the cargo transshipment may be delayed or the cargo quantity is insufficient and the cargo space is damaged.The ship arrives at the port in time to save the extra cost caused by missing the transit time.

3.3. Other Indirect Economic Benefits

Due to the delay of the shipping date of large container ships, the indirect impact on shippers cannot be ignored.General owners, because of delayed delivery of goods, increase the cost of capital occupation;For zero inventory management of processing or processing enterprises, because of the delay of raw materials, resulting in the shutdown of enterprises waiting for materials or leading to the imbalance of production of related enterprises;For trading companies with follow-up contracts, liquidated damages may be paid for failure to realize sales on time.All of the above situations may cause huge economic losses.The improvement of pilotage efficiency can effectively reduce the economic losses mentioned above.

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4. Social Benefit Evaluation and Analysis

The improvement and reduction of pilotage efficiency can effectively reduce the loss that may be caused by ships waiting for berths in the port, ensure the smooth transfer of feeder lines, and relieve the subsequent backlog of ports and road congestion.The contribution to land traffic is mainly reflected in the reduction of road traffic accidents and the guarantee of road patency, which brings inestimable contribution to the whole social economy.If the road conditions are congested and the container trucks are overstocked in the road, it is difficult to find suitable trucks for timely shipment of the goods, thus affecting the realization of export trade contracts and affecting the external reputation of the cargo owners.The improvement of pilotage efficiency helps to reduce this situation.If there are phenomena such as port overstock, congestion of collection and distribution lines, and delayed delivery of goods, the losses will eventually be transferred to terminal consumers in various forms, increasing the social logistics costs and increasing the economic burden on enterprises and individuals.This causes the price fluctuation of social related commodities, which affects the daily life of the public and the economic life of the whole society.The improvement of pilotage efficiency can effectively avoid this situation, which will have a positive impact on the whole society.

5. Conclusion

The implementation phase iv pilot performance, not only avoid the harbor and shipping enterprises economic losses, at the same time, also improved the route integrity, an enhanced the core competitive capacity of the port, strengthened the yangshan deep-water port as the status of the container hub port in northeast China, the yangshan deep-water port on the premise of not increase the size of the construction obtained a bigger development space, obtain various comprehensive benefits.

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