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Capacity Expansion of Chemical Ships---A Case study of China Shipping Chemical Carrier., Ltd

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ABSTRACT

With the rapid development of chemical industry in China, the output and configuration of chemical products witnessed a considerable change, which leads to the growth trend of chemical shipping transportation. In order to meet the needs, chemical transportation enterprises devoted themselves in capacity expansion. However, there must be an optimized decision between purchase and chartering in this market situation, and the capacity configuration also plays an important role in profit-making. This article takes China Shipping Chemical Carrier., Ltd as an example, make a comprehensive comparison and calculation between different methods of capacity expansion and optimize the capacity allocation for the company, which could also cast light on similar decisions and serve as a reference for the whole industry.

Keywords: chemical shipping transportation, capacity expansion, capacity configuration

INTRODUCTION

With the rapid development of China's economy, dangerous chemicals have become indispensable materials for industry, agriculture, national defense and people's daily life. More and more attention has been paid to the transportation of chemicals at the national level . However, China's chemical transportation by sea started late, which leads to the disadvantages and hysteresis of ship model and quality, operating management and scope and scale of transportation. For example, the transportation risk analysis on dangerous chemicals in China began in the 1990s, more than 10 years later than in foreign countries.(Zhang J.H , Zhao L.J, 2007)

Chemical transportation is a kind of special transportationÿwhich refers to the transportation of unconventional articles using special vehicles and ships by special organizations or technical personnel . Generally, only after being strictly reviewed by relevant national functional departments and having corresponding facilities and equipment to ensure the safe transportation of dangerous goods, can they be qualified for chemical transportation.

Chemical ship is a kind of high-tech and high value-added ship specially used to transport petroleum products, petrochemical products, chemical synthetic products and liquid cargo of animal and vegetable oils. As chemical tankers carry a wide variety of goods which have different natures, they can be classified into general tankers, petroleum product tankers, multi variety co-loading tankers, multi-purpose chemical tankers, special chemical tankers, liquefied gas tankers, etc. according to the classification of goods carriedÿwhen it comes to the different structure of cargo tank, it can be divided into integrated cargo tank and independent cargo tank .

There are three difficulties in the transportation of chemicals in the market. First, there is a serious imbalance between supply and demand in the market. Under the influence of the transformation and upgrading of China's petrochemical industry and the policies of resolving overcapacity, the output of chemical industry shows a continuous downward trend, and the transportation demand is further restricted. In addition, the development of "integration" of chemical industry park and the diversion of chemical transportation caused by land transportation also lead to the reduction of chemical water transportation demand. In terms of transportation capacity, although the Ministry of transport issued policies to intervene and regulate the transportation capacity of domestic chemicals, and the situation of excess capacity has been improved to some extent by means of withdrawing the old capacity from the market

and strictly controlling the number of new ships, the problem of excess capacity still exists. Second, as for transportation, chemical transportation has higher requirements for ships. Most of liquid chemicals are toxic, flammable and corrosive liquid cargo, so the structural characteristics of liquid chemicals ships are: there are many relatively small watertight cargo tanks, and the bulkheads are made of stainless steel and other metal bodies with strong corrosion resistance; double bottom is set to prevent leakage of chemical liquid; middle cargo holds are used for toxic substances; steam pump is used to load and unload goods. Therefore, the construction cost and core technology of chemical ships need quite high requirements. In addition, it takes a lot of time for the ship to wash the tank after unloading at the port, and sometimes the time for washing the tank even exceeds the time for the ship to sail, which is also one of the unique difficulties of chemical transportation by sea. Third, when it comes to management level, because of the particularity of chemicals and their high value, the risk of chemical transportation is great, which poses a huge challenge to the management of shipping companies. The crew must strictly abide by the transportation rules and specialize in transportation, loading and unloading, cabin washing and navigation related matters. At the same time, the shipping company also needs to make reasonable routes and arrange corresponding ships according to relevant factors such as cargo source and cargo volume, and carry out appropriate and reasonable personnel allocation management. In addition, the ship company will also be limited by the national policies in the management process, which leads to the fact that not all decisions can create maximize profits. Therefore, it is necessary to actively follow the important political decisions of the country at all times, and carefully predict the future trend of the industry, so that its own decisions can be optimized.

Therefore, this paper reviews relevant researches at home and abroad. Chemical transportation by sea is a high-risk industry, which requires crew equipped with knowledge of associated hazards, safety measures, pollution prevention and emergency operations. (Parunov, J, 2009)However, the global chemical tanker shipping market size was valued at USD2072.6 billion in 2016, which indicates a considerable opportunity. Hazardous chemicals can get into risk situations if they do not take into account the system and the content of the atmosphere above the cargo tankers. There are 3 specified standards of chemical ships and they must conform to the rules and requirements of IBC code or BCH code. Many maritime economists believe that the supply of chemical shipping operation under perfect competition is characterized by a lot of conditions, one of which is the decisions of the companies concerning new building ships, secondhand ships and chartering. And chemical shipping is one of the world's most complex shipping sectors, with very high barrier to entry due to varied type and technical and operational requirements of the chemical industry. With the increasing demand for chemical tankers in China these years, the Chinese marine industry has begun paying more attention to this market segment. Risk analysis of dangerous chemicals transportation has long been concerned by the international practice circle and academic circle. (Zhang J.H, Zhao L.Jÿ2007 ÿAs has been mentioned above, hazardous characteristics of chemical substances, uncertainties and disruptions pose significant challenges to chemical supply chain transportation operations, as well as the surrounding environment.(Bonvicini S, etal., 1998) In response, China's relevant companies involved in the chain, especially chemical shipping carriers have to implement a large variety of methods to manage their chemical supply chain in order to maintain the effectiveness and efficiency.(Thun and Hoenig, 2011) In addition, governments and authorities have introduced a substantial body of legislation, regulatory guidance and recommendations to ensure the safety of chemical transportation.(Furuhama A, etal., 2011; Fisk, 2014; Scruggs et al., 2014) And related scientific researches concerning chemical shipping transportation in China should also follow the pace. However, the translation of different kinds of risk consequences into a specific aspect is a challenging and vulnerable element in risk management which needs more efforts (Waters C.D.J ,2011). From the prospective of companies involved, besides the establishment of a strong and effective management structure, how to occupy a larger market share and adjust the transportation capacity configuration is the key point.

1. ANALYSIS OF CURRENT SITUATION AND OPPORTUNITIES OF CHEMICALS IN CHINA

High concentration of shipping capacity. The coastal transportation capacity of chemicals in China is

characterized by high concentration. According to statistics by the end of 2018, although there are 64 enterprises operating coastal chemical ships, the transportation capacity is mainly concentrated in several large-scale transportation enterprises, and the total transportation capacity of a few companies accounts for a considerable proportion of the market, while most enterprises only have a very small number. Therefore, it also reflects that the scale of enterprises in China's chemical coastal transport market is generally small, and a few large-scale enterprises have certain monopoly. The transport capacity of small enterprises is difficult to compete with large ones, and there is relatively fierce competition between small enterprises. The vicious competition will further lead to the hidden danger of chemical water transportation industry, and also disturb the normal order of the market.

(1) Large number of small ships

Under the macro-control of the Ministry of transport, in 2018, the scale of domestic chemicals transportation capacity was controlled, and the excess situation was gradually improved. In the first half of the year, the Ministry of transport appropriately relaxed the examination and approval conditions. As of June 30, the scale of coastal provincial chemical transport (including oil and chemical dual-use ships) was 282 ships and 1110100 DWT, with an increase of 10 ships and 48600 DWT compared with the end of 2017, with a growth rate of 4.2% in half a year and a year-on-year growth of 4.8%. There exist no compulsory scrapped ships; 3 chemical ships with 9600 DWT withdrew from coastal provincial water transport market in advance. The average age of coastal provincial chemical ships is 9.59 years, among which 77 are old ships (more than 12 years old) and one is special inspection ships (more than 26 years old), accounting for 27.3% and 0.35% of the total.

Ships under 3000dwt class are relatively old; the market is relatively closed, and the shipowner's cargo source is relatively fixed, mainly for short-distance transportation. Benefiting from the small batch characteristics of fine chemicals, the operation of 1500-2000 ton ships is in good condition.

The number of 3000-4999dwt class ships is 89 (32% of the total) and 329300 DWT (30% of the total DWT), with an average age of 8 years, which is relatively young. Most of the chemical transportation markets are mainly 3000-4000dwt batches.

The number of 5000-8999dwt class ships is 58 (21% of the total) and 433900 DWT (39% of the total DWT) , with an average age of 7 years , which is the youngest. Such ships are distributed among 20 shipowners in China, with an average of 2.5 per shipowner, and the transportation capacity is relatively scattered.

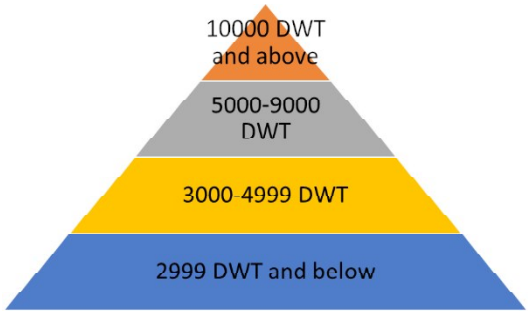

Figure 1: Classification of chemical ships' deadweight tonnage

The number of ships above 9000dwt class is 12 (4% of the total) and 158700 DWT (14.3% of the total DWT) , which are possessed by 6 shipowners who only have one or two ships.(Data source: Shanghai Shipping Exchange)

(2) Obvious derivation

The coastal transportation of chemicals has obvious derivation. The layout of China's coastal petrochemical industry determines that the flow direction of China's chemical coastal transportation is mainly from north to south, and regional short barge transportation coexists. As the main production place of primary chemicals in China, North China is the outflow place of chemical transportation; As the main chemical processing and consumption area in China, South China is the destination of chemical transportation flow: the flow direction of chemical transportation is roughly determined. At the same time, the regional and integrated development of petrochemical industry has created a market for short barge transportation in the region.

The reduction of transportation demand by trade exchange and internal mutual supply

China's chemical industry has experienced long-term development and formed a relatively stable production, processing and trade chain, especially for large enterprises. The integrated development is more conducive to the internal and nearby supply, not only ensuring the stability of supply, but also realizing cost saving. Such a development trend directly leads to the shortening of the average transportation distance. Large enterprises have the ability to master a large number of

chemical goods resources, and at the same time have sufficient capacity to build a trade chain integrating production, processing and transportation, which makes the external transportation enterprises face the situation of goods supply reduction , thus weakening the role of transportation enterprises in the chemical industry chain.

1.1 Opportunity Analysis

The completion of many large-scale chemical projects along the coast indicates the growth trend of domestic chemical trade volume in China. Chemical transportation companies have invested in shipbuilding, which will further aggravate the contradiction between supply and demand, thus causing price competition, illegal operation and other issues. In addition, chemical transportation needs experienced and mature personnel management, which suggests that new participants may bring some risks. The interaction of the market makes the domestic chemical coastal transportation market overall depressed because of the pessimistic global background.

Relevant laws and regulations are formulated by the State Administration to ensure the safety of the chemical water transportation market and the balance between supply and demand. Compared with other cargoes, China's coastal chemical transportation market management system is not mature enough. It is of great significance to grasp the market situation and provide reference for decision makers through scientific methods.

With the implementation of "The Belt and Road Initiative" in China, the traditional coastal chemical water transportation market pattern may change accordingly, which is both an opportunity and a challenge. The large-scale influx of chemical transportation companies puts forward higher and stricter requirements for the management level of the market. Grasping the opportunity in the complex environment is related to the survival of the enterprise.

2. CURRENT SITUATION ANALYSIS OF CHINA SHPPING CHEMICAL CARRIER. LTD.

In this paper, China Shipping Chemical Carrier. Ltd. is taken as the research object. Its parent company, as the leading enterprise of China's shipping industry, serves all fields of maritime transportation industry.

The SWOT analysis of the company is carried out, as shown in Table 2.

Table 1- SWOT Analysis

	Strength (S) **(1)Long history** **(2)COSCO brand effect** **(3)Sufficient operation qualification**	**Weakness (W)** **(1)High cost** **(2)Complex approval process of state-owned enterprises** **(3)Limited capacity**
Opportunity (O) **(1)The prospect of chemical transportation is promising, and the country attaches great importance to it** **(2)Most shipping companies are saturated.**	SO strategy Make use of the brand power of COSCO to force the ship companies which are already saturated to give up chemical transportation due to strong competitive pressure.Make full use of sufficient development experience and national attention to encourage innovative research. Obtain more qualifications and expand the scope of transportation.	WO strategy Expand the scale of transportation capacity to occupy a considerable market share with the support of the state.
Threat (T) **(1) Competitive pressure in the same industry** **(2) The flow direction of domestic chemicals** **(3) Shortened economic cycle**	ST strategy Select routes with high profit and qualification requirements.and accumulate customers with sufficient qualifications.Take advantage of COSCO's strong financial background to deal with economic instability.	WT strategy Control the cost layer by layer. Employ the crew with sufficient professional knowledge and excellent professional skills to ensure the safe operation and effective management of the ship.

Through the SWOT analysis of China Shipping Chemical Carrier.,Ltd, it can be concluded that the prospect of chemical transportation in China is promising.The advantages brought to China Shipping Chemical Carrier.,Ltd are obvious, but there are also some threats, so we put forwards some suggestions accordingly:

(1) Expand operation scale. Customers of chemical transportation are relatively large companies, and corresponding contracts are usually long-term. However, the company's ability to guarantee the logistics needs of some large customers is insufficient. Expanding the scale of transport capacity can not only meet the needs of large domestic customers, but

also broaden the overseas market and achieve leapfrog development under the influence of "The Belt and Road Initiative".

(1) Make full use of qualifications. The strict control of chemical transportation by the state makes it a foothold for enterprises to obtain and make full use of operation qualifications and occupy the market share of domestic trade.

(2) Control cost for each link. The cost and steps of chemical transportation are much more than that of general cargo transportation. Because of the indispensable process and high security requirements, companies tend to ignore cost reduction from details.

(3) Expand the scope of operation with national policies. The company can expand the transportation confined to China's coastal areas to Southeast Asia, the Middle East and even Africa, in response to "The Belt and Road Initiative", to realize the situation that maximize the interests of the government and the state while maximizing the interests of the company.

3. CAPACITY ALLOCATION ANALYSIS

3.1 Market forecast

Stable growth will be witnessed of total import and export volume. According to customs statistics, in the first 10 months of 2018, the import volume of China's chemical industry and related industrial products was 844.1 billion yuan, with a year-on-year increase of 15.6%, and the export volume was 735.3 billion yuan, with a year-on-year increase of 17.5%.

The growth of water transportation demand should never be underestimated. In recent years, there are two basic characteristics of the water transportation pattern of coastal liquid chemicals. One is short-distance transportation, including North China, East China and South China, the other is interregional transportation, including North China to East China, North China to South China, and between East China and South China. According to the analysis of the Chemical Industry Transportation Committee of China Shipowners Association, with the continuous production of a number of large-scale refining and chemical enterprises and downstream supporting chemical plants planned and constructed in the 13th five year plan, and the promotion of large-scale coastal MTO projects, the growth rate of coastal liquid chemical industry transportation increased from about 3% before 2018 to about 7% in 2018, and there will be explosive growth from 2019. It is not hard to see that the demand for chemical water transportation was growing slowly before 2017, and since 2018, the chemical water transportation market has obvious signs of recovery, which is an opportunity for all chemical shipping companies. Therefore, we believe that it is necessary for China Shipping Chemical Carrier.,Ltd to seize the opportunity of market recovery and make some adjustments to its transportation capacity allocation of chemical ships .

The scale of transportation is expanded. The total transportation volume of ethylene glycol, pure benzene, styrene and other products depends on the start-up of ethylene plant. In the future, with the continuous production of new integrated refining units, the total transportation volume of the above products will increase accordingly. At present, this kind of products are mainly transported in batches of 3000 tons or less and regionally. In the future, the transportation batches will gradually increase. Glycol is the main chemical transported by China Shipping Chemical Carrier Ltd,. and the increase of its transportation batch means that the recovery of chemical water transportation market has a substantial effect on the company. Under the macro-control of the Ministry of transport, in 2018, the scale of domestic chemicals transportation capacity was controlled, and the situation of excess transportation capacity was gradually improved. In the first half of the year, the Ministry of transport appropriately relaxed the examination and approval conditions. As of June 30, the

scale of coastal provincial chemical transport ships (including oil and chemical dual-use ships) was 282, 1110100 DWT, with an increase of 10, 48600 DWT, compared with the end of 2017, with a growth rate of 4.2% in half a year and a year-on-year growth of 4.8%. This data shows that the restrictions of national policies on domestic trade and transportation capacity of chemicals are gradually relaxed, that is to say, the chemical transportation market is gradually expanding, and the relaxation of approval is undoubtedly good news for state-owned enterprises similar to China Shipping Chemical Carrier.,Ltd, which indicates that the time of application process for chemical transportation is being reduced, and the efficiency of the whole transportation process is being improved to a certain extent.

Freight rates are increasing. In 2018, China's chemical transportation market overall stabilized, with the increase of freight rate of some routes by 2% - 3%, and the growth trend of freight rate has been formed. Thanks to the effective implementation of capacity control measures in recent years, the actual delivery capacity is under control; the rise of freight rate will cause fierce competition, so we think that the company should seize the opportunity to timely grasp the market trend.

3.2 Capacity Expansion Analysis

According to the market analysis and the pain point analysis of China Shipping Chemical Carrier Ltd., the short board—insufficient transportation capacity will be the obstacle to the expansion of its revenue. Therefore, we think it is necessary for the company to expand its transportation capacity to meet the market.

(1) Mode of capacity expansion

1. chartering: Chartering is flexible, which is suitable for the company without long-term stable and sufficient supply of goods and for the short-term demand for transportation capacity.
2. shipbuilding: Shipbuilding is stable, which is suitable for the company with long-term stable and sufficient supply of goods, and for the long-term demand for transportation capacity.

(2) Analysis of the company

At present, the supply and demand of shipping capacity in the chemical water transportation market is in a relatively balanced state. It is not difficult to notice the growing market demand through the market forecast in the next few years. In this ideal market, each shipping company will extremely cherish its own transportation capacity, which means that the possibility of renting ships from other companies is really low. In addition, as a state-owned enterprise, China Shipping Chemical Carrier.,Ltd has the official integrity that private enterprises do not have, which means that once the short board of insufficient transportation capacity is solved, and it has the ability to carry out long-term and stable cooperation with chemical source companies, the later will be more inclined to cooperate with such state-owned enterprise.

CONCLUSION

Through the analysis of the chemical water transportation market and the company's situation, we can draw the conclusion that shipbuilding is more suitable for China Shipping Chemical Carrier.,Ltd. At the same time, combined with the current growth trend and proportion of transportation capacity in the chemical water transportation market, we suggest that the company build two new ships of 12000-13000 gross tons, about 5000 deadweight tons.

4. SCHEME CONSTUUCTION AND CALCULATION

Based on the capacity expansion, we study the capacity allocation for the company to maximize its revenue. According to the analysis of coastal transportation capacity of chemicals in China, it is found that the majority are small ships. According to the relevant statistical data, in 2014, there were 11 ships with a capacity of more than 10000 DWT, 40 ships with a capacity of 5000-9000 DWT, 71 ships with a capacity of 3000-5000 DWT, 59 ships with a capacity of 1800-3000 DWT and 118 small chemical ships with a capacity of less than 1800 DWT. It is not hard to know that larger ships are more competitive in the coastal chemical water transportation market. Therefore, we have made the following capacity allocation scheme:

Two new large ships are used for coastal transportation (North China—East China—South China and South China—Taiwan—Southeast Asia routes), while two existing small ships are divided into two configurations according to the market.

1. Inland transportation shall be carried out when the market is good and the freight rate is high.

2. They shall be leased to other shipping companies by time charter or voyage charter, when the market is relatively unsatisfactory and the freight rate is relatively low.

1.2 income comparison before and after shipbuilding

Table 2 Revenue prediction of single voyage transportation of large ships

Ship name	XXX	Cargo	Chemical products	Voyage number
Route	Shanghai——Quanzhou	Fixed cost per day(yuan)	3000	
Volume(ton)	5000	Distance(nm)		FO
GO				
Freight(yuan/ton)	180	Sailing time(day)	3.2	Fuel consumption
standard				
	5.5	0.3		
Commission %	2.50	Port time	6.8	Fuel consumption
17.6	2.7			
		Voyage time	10	Bunker price
603.78	824.06			
FO fee(yuan)	10626.53	Loading cost	6000	
GO fee(yuan)	2472.18	Unloading cost	5000	
Total fuel consumption (yuan)	13098.71	Total port cost	11000	
Total freight	900000.00	Total Variable cost	24098.71	
Commission	22500.00	Total fixed cost	30000.00	
Net freight	877500.00	Total cost	54098.71	
Profit (yuan)	823401.29	Profit per day	82340.13	

FO fee=FO Fuel consumption standard ÿ5.5 ÿ×sailing time ÿ3.2 ÿ×FO bunker priceÿ603.78 ÿ=10626.528
GO fee=GO Fuel consumption standardÿ0.3 ÿ×voyage timeÿ10 ÿ×GO bunker priceÿ824.06 ÿ=2472.18

Table 3 Revenue prediction of single voyage transportation of small ships

Ship name	Jin Hailan	Cargo	Chemical products	Voyage number
Route	Shanghai——Quanzhou	Fixed cost per day(yuan)	2000	
Volume(ton)	2355	Distance(nm)		FO
GO				
Freight(yuan/ton)	190	Sailing time(day)	2.8	Fuel consumption
standard				
	5.5	0.3		
Commission %	2.50	Port time	5.2	Fuel consumption
15.4	2.4			
		Voyage time	8	Bunker price
603.78	824.06			
FO fee(yuan)	9298.21	Loading cost	3500	
GO fee(yuan)	1977.74	Unloading cost	3000	
Total fuel consumption (yuan)	11275.95	Total port cost	6500	
Total freight	447450.00	Total Variable cost	17775.95	
Commission	11186.25	Total fixed cost	16000.00	
Net freight	436263.75	Total cost	33775.95	
Profit (yuan)	402487.80	Profit per day	50310.98	

FO fee=FO Fuel consumption standardÿ5.5 ÿ×sailing timeÿ2.8 ÿ×FO bunker priceÿ603.78 ÿ=9298.212
GO fee=GO Fuel consumption standardÿ0.3 ÿ×voyage timeÿ8 ÿ×GO bunker priceÿ824.06 ÿ=1977.74

Table 4 Revenue prediction of single voyage transportation of inland water

Ship name	Jin Hailan	cargo	Chemical product	Voyage number
Route	Nanjing——Chongqing	Fixed cost per day(yuan)	2000	
Volume(ton)	2355	Distance(nm)		FO
GO				
Freight(yuan/ton)	210	Sailing time(day)	9.8	Fuel consumption standard
	5.5	0.3		
Commission %	2.50	Port time	5.2	Fuel consumption 53.9
4.5				
		Voyage time	15	Bunker price
603.78	824.06			
FO fee(yuan)	32543.74	Loading cost	3500	
GO fee(yuan)	3708.27	Unloading cost	3000	
Total fuel consumption (yuan)	36252.01	Total port cost	6500	
Total freight	494550	Total Variable cost	42752.01	
Commission	12363.75	Total fixed cost	30000.00	
Net freight	482186.25	Total cost	72752.01	
Profit (yuan)	409434.24	Profit per day	27295.62	

FO fee=FO Fuel consumption standardÿ5.5 ÿ×sailing timeÿ9.8 ÿ×FO bunker priceÿ603.78 ÿ=32543.74
GO fee=GO Fuel consumption standardÿ0.3 ÿ×voyage timeÿ15 ÿ×GObunker priceÿ824.06 ÿ=3708.27

Revenue comparison before and after shipbuildingÿ

1. daily revenue before shipbuilding
   50310.98×2”ÿ100621.96yuan
2. daily revenue after shipbuilding
   82340.13×2+27295.62×2”ÿ219271.50yuan
3. the increase of daily revenue after shipbuilding
   219271.50-100621.96”ÿ118649.54yuan
4. the increase of annual revenue after shipbuilding in theory
   118649.54×365”ÿ43307082.1yuan

Note: ships are not operating 365 days a year, so the actual annual revenue increase is less than the theoretical annual revenue increase old ship capacity allocation: Market situation along the Yangtze River. Along the Yangtze River is an important chemical industry belt in China, and the output of chemical products accounts for more than 40% of the whole country. In recent years, the transportation volume of dangerous chemicals in the Yangtze River trunk line has increased by 7.5% annually. It is predicted that it will increase steadily, reaching 240 million tons by 2030, with an annual growth rate of 2.7%. It is estimated that 10000-30000 ton ships will be mainly used in the lower Nanjing section and 5000 ton ships will be mainly used in the upper Nanjing section. Time charter income According to the current market price, the daily rent of 2355 net tons ships is 17000 yuan Inland transportation income According to the market situation, the company’s original ships have more advantages in the transportation of the upper Nanjing section along the Yangtze River. Take the voyage from Nanjing to Chongqing as an example, the daily profit of inland transportation is 27295.62 yuan. Considering the income difference between time charter and inland transportation, under the current market situation, it is advisable to transfer the original ships to inland transportation along the Yangtze River.

Allocation Result

Two newly built 12000 DWT ships are deployed on the East China-North China-South China and East China-South China-Taiwan (Southeast Asia) routes (calculated by 2.2 voyages per month, with an annual revenue of 43.48 million).The original two ships, Jin Hailan and Jin Haitao, are deployed on the Nanjing-Jiangxi-Hunan and Hunan-Hubei-Chongqing routes (calculated by 1.6 voyages per month, with an annual revenue of 15.72 million),which leads to a total annual revenue of 59.2 million.

5. CONLUSION

Firstly, this paper analyzes the characteristics of chemical transportation and points out that it is difficult and demanding to transport chemicals; Secondly, the paper analyzes the current situation and opportunities of China’s chemical transportation market, and finds that with the increase of chemical transportation volume, China’s

demand for chemical transportation capacity is also increasing, thus causing the increase of freight rate; Then, it analyzes the opportunities and challenges of SWOT (full name), and points out that China Shipping Chemical Carrier.,Ltd. Can solve its problem by expanding the company's chemical transportation capacity; In terms of capacity expansion, this paper puts forward two schemes: chartering and shipbuilding. Through specific calculation and analysis, it comes to the conclusion that the shipbuilding scheme can achieve greater benefits. At the same time, the new and old capacity of the company is reasonably allocated.

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