

**Кафедра управления морским транспортом**

**Дисциплина:** **«Технология и организация перевозок» (ТиОП)**

“The Technology and Organization of Cargo Carriage”

КУРСОВАЯ РАБОТА

Тема: ВЫБОР ОПТИМАЛЬНОГО ТИПА СУДНА ДЛЯ ЗАДАННОГО

НАПРАВЛЕНИЯ

NOMINATION OF THE BEST TYPE OF VESSEL FOR SETPOINT

DIRECTION

Вариант № 61

|  |  |
| --- | --- |
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Владивосток

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**ЗАДАНИЕ**

на курсовую работу по дисциплине

**«ТЕХНОЛОГИЯ И ОРГАНИЗАЦИЯ ПЕРЕВОЗОК»**

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Тема задания: Выбор оптимального типа судна для заданного направления

NOMINATION THE BEST TYPE OF VESSEL FOR SETPOINT DIRECTION

Исходные данные:

Вариант: 61

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Направление (Direction) | Род груза  (Cargo) | Объем перевозки (Volume) (тыс.т) | Тип судна  (Type of vessel) | Тэкс  (суток) |
| Ванино – Корсаков (Vanino – Korsakov) | Минеральные удобрения (mineral fertilizer) | 65 | Сухогруз  (Dry cargo vessel) | 330 |
| Корсаков - Иокогама (Korsakov – Yokohama) | Металлолом  (Scrap metal) | 190 |
| Иокогама – Ванино (Yokohama – Vanino) | Бытовое электрическое оборудование (household electrical equipment) | 80 |

Графическая часть: 1. Графики зависимостей

2. Схема судна

Дата выдачи: «14» февраля 2023 г.

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Преподаватель: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ /Пестерев С.В./

Студент: Калугин М. А.

**CONTENTS**

Introduction . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

1. General guidelines. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   1. Explanatory note and graphic material preparation. . . . . . . . . . . . . . . . .
   2. Explanatory note filling. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   3. Graphic part of the coursework. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   4. Prototype vessel calculations . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
2. Coursework stages guidelines . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
   1. Type of vessel requirements justification. . . . . . . . . . . . . . . . . . . . . . . .
      1. Operation of ships at a given direction external conditions analysis. .
      2. Cargo transport characteristics. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
      3. Line parameters calculation . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
      4. Selected vessel type basic requirements . . . . . . . . . . . . . . . . . . . . . . .
   2. Variant series variation and definition boundaries justification . . . . . .

2.2.1. The choice of boundaries and intervals of variation by net load capacity

* + 1. Choice of boundaries and intervals of variation in speed. . . . . . . . . . .
    2. Choice of boundaries and intervals of variation by type of SPP. . . . . .
  1. Vessel weight calculation . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  2. Vessel carrying capacity and number of vessels calculation. . . . . . . . . .
  3. Vessel construction cost calculation. . . . . . . . . . . . . . . . . . . . . . . . . . . .
  4. Estimated vessel operating costs calculation . . . . . . . . . . . . . . . . . . . . .
     1. Expenses calculation using national currency. . . . . . . . . . . . . . . . . . .
     2. Expenses calculation using foreign currency. . . . . . . . . . . . . . . . . . .
  5. Determining monetary and financial indicators of the ship's operation
  6. Nominating the best variant . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
  7. Calculation of the main dimensions of the selected vessel type. . . . . . .
  8. Results of designing the optimal type of ship for a given line. . . . . . . .

Application . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Bibliography . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**INTRODUCTION**

«Nomination of the best type of vessel for setpoint direction» coursework is to be done by 3rd year students (including foreign students) studying «Technology of transport processes» (Transportation and Management in water transport). It is based on the course project "Designing the optimal type of vessel for a given line" and edited by L.I. Yudenkova on the recommendation of the Department of MTM of MSU named after admiral G.I. Nevelskoy, reflecting changes in the transport market. The introduction of anti-Russian sanctions and the movement of cargo flows from the Western to the Far Eastern basin of the Russian Federation. The purpose of this course project is to consolidate theoretical knowledge and acquire practical skills related to the development of the best service for opening a new international shipping line.

Calculation and publication of an attractive schedule for customers, tariffs (with surcharges and discounts), as well as substantiation of the main operational and technical characteristics of new types of ships is the most important task when planning the development of international maritime transport, since the competitiveness and further development or bankruptcy of the shipping industry depend on the correct determination of these parameters. companies in the global freight market.

The specificity of the maritime transportation market lies in its openness to the participation of shipping companies from almost all developed countries of the world. So from ports of China and from the ports of South Korea there previously only were two lines, which are Fesco China Direct Line (FCDL) and Korea-Soviet Direct Line (KSDL) respectively.

Since then, 10 different new companies shipped their cargo between these ports, including: MAERSK (Holland), American President Line (Singapore), MSC (Switzerland), CMA-CGM (France), SINOKOR (S. Korea) and others, which leads to the conclusion that such a factor as import-substituting Russian transport service is exceptionally important - to provide the best intermodal transportation service in marine container business.

The main goal (task) of this coursework is to make students, on the basis of improving their previously acquired knowledge, able to correctly substantiate the parameters for opening a new shipping line with the development of a competitive vessel and service project, including:

- making schedules

- calculating basic tariffs (with discounts and rebates)

- nominating the best type of vessel - stevedore contract with a container terminal (carriage contract).

The second task is to preparate students for theoretical work in foreign and joint shipping companies, including NVOCC, as well as in their representative offices abroad, therefore, the maximum volume of the course project is recommended to be written in English



**2.1. Type of vessel requirements justification**

The correct choice of ship type can only be made after a deep analysis of the factors that affect the final performance of the ship. The study of these factors can be performed in the following sequence:

* the volume, structure and dynamics of cargo flows in given directions are studied;
* studying the external conditions of operation of ships;
* the transport characteristics of the given cargoes are studied;
* analyzes the experience of the fleet (prototypes) in this direction for a number of years;
* generalized and formed requirements for the designed type of vessel and the organization of vessel traffic in a given direction.

**2.1.1. Operation of ships at a given direction external conditions analysis**

The Sea of Japan occupies the southernmost position compared to the rest of the Far Eastern seas. This sea is located between Eurasia and Korea. Sakhalin and the Japanese Islands are the frontiers delimiting the waters of the Sea of Japan from the Pacific basin.

The area of the water surface is 1062 thousand square kilometers with a volume of water of about 1630 thousand km3. The depth of the Sea of Japan is 1535 m on average, while maximum depth is 3699 m. This sea belongs to the marginal oceanic seas.

There are no large islands in the waters of the Sea of Japan. Among the small islands, the most famous are: Moner, Rebun, Oshima, Sado, Askold, Russian, Putyatin. All these islands are located near the coast. The predominant part of the islands is located in the east of the sea.

The salinity of the water of the Sea of Japan is 33.7-34.3%, which is slightly lower than the average salinity of the waters of the World Ocean.

The climate of the Sea of Japan is temperate, monsoonal. The northern and western parts of the sea are much colder than the southern and eastern parts. In the coldest months (from January to February), the average air temperature in the northern part of the sea is about -20 °С, while in the south it’s about +5 °С. The summer monsoon brings some warm and humid air. The low temperatures off the west coast are largely caused by the cold current passing there.

According to ice forming conditions, the Sea of Japan can be divided into three regions:

Tatar Strait, the area along the coast of Primorye from Cape Povorotny to Cape Belkin and Peter the Great Bay. In winter, ice is only constantly observed in the Tatar Strait and Peter the Great Bay. In the rest of the water area, with the exception of closed bays and gulfs in the northwestern part of the sea, it is not always formed.

The Sea of Okhotsk is a [marginal sea](https://en.wikipedia.org/wiki/Marginal_sea) of the western [Pacific Ocean](https://en.wikipedia.org/wiki/Pacific_Ocean). It is located between [Russia](https://en.wikipedia.org/wiki/Russia)'s [Kamchatka Peninsula](https://en.wikipedia.org/wiki/Kamchatka_Peninsula) on the east, the [Kuril Islands](https://en.wikipedia.org/wiki/Kuril_Islands) on the southeast, [Japan](https://en.wikipedia.org/wiki/Japan)'s island of [Hokkaido](https://en.wikipedia.org/wiki/Hokkaido) on the south, the island of [Sakhalin](https://en.wikipedia.org/wiki/Sakhalin) along the west, and a stretch of eastern [Siberian](https://en.wikipedia.org/wiki/Siberia) coast along the west and north

It is connected to the [Sea of Japan](https://en.wikipedia.org/wiki/Sea_of_Japan) on either side of Sakhalin: on the west through the [Sakhalin Gulf](https://en.wikipedia.org/wiki/Sakhalin_Gulf) and the [Gulf of Tartary](https://en.wikipedia.org/wiki/Gulf_of_Tartary); on the south through the [La Pérouse Strait](https://en.wikipedia.org/wiki/La_P%C3%A9rouse_Strait).

In winter, navigation on the Sea of Okhotsk is impeded by [ice floes](https://en.wikipedia.org/wiki/Ice_floes). Ice floes form due to the large amount of freshwater from the [Amur River](https://en.wikipedia.org/wiki/Amur_River), lowering the [salinity](https://en.wikipedia.org/wiki/Salinity) of upper levels, often raising the [freezing point](https://en.wikipedia.org/wiki/Freezing_point) of the sea surface. The distribution and thickness of ice floes depends on many factors: the location, the time of year, water currents, and the sea temperatures.

Cold air from Siberia forms sea ice in the northwestern Sea of Okhotsk. As the ice forms, it expels salt into the deeper layers. This heavy water flows east toward the Pacific, carrying oxygen and nutrients, supporting abundant sea life. The Sea of Okhotsk has warmed in some places by as much as 3°C (5.4°F) since preindustrial times, three times faster than the global mean. Warming inhibits the formation of sea ice and also drives fish populations north.

With the exception of [Hokkaido](https://en.wikipedia.org/wiki/Hokkaido), one of the Japanese [home islands](https://en.wikipedia.org/wiki/Japanese_Archipelago), the sea is surrounded on all sides by territory administered by the Russian Federation. South [Sakhalin](https://en.wikipedia.org/wiki/Sakhalin) and the [Kuril Islands](https://en.wikipedia.org/wiki/Kuril_islands) were administered by Japan until 1945. Japan claims the southern Kuril Islands and refers to them as [Northern Territories](https://en.wikipedia.org/wiki/Kuril_islands_dispute).

**2.1.2 Cargo transport characteristics**

"Fertilizers" is a general term for a group of substances with widely varying properties. Some such as potassium chloride and super phosphate, are harmless whilst others, such as Ammonium Nitrate Fertilizers are inherently dangerous. Many fertilizers slowly corrode metals particularly in the presence of water or moisture.  
Ammonium sulfate, (NH4)2SO4, is an inorganic salt with a number of commercial uses. It contains 21% nitrogen as ammonium cations, and 24% sulfur as sulfate anions.  
It is used largely as an artificial fertilizer for alkaline soils. It is also used as an agricultural spray adjuvant for water soluble insecticides, herbicides, and fungicides.   
It is also used in the preparation of other ammonium salts.  
Ammonium sulfate decomposes upon heating above 250°C, first forming ammonium bisulfate. Heating at higher temperatures results in decomposition into ammonia, nitrogen, sulfur dioxide, and water.

Sulphate of ammonia is a crystalline solid usually packed in bags. When free acid content is excessive, usual maximum being 0,025%, rotting of bags may take place. Bags which have rotted in this way may give the appearance of being torn by rough handling. Bags often arrive in stained condition. Subject to loss in weight. Product to be kept as dry as practicable.  
Ammonium sulphate comprise brownish-grey to white crystals. Soluble in water. Free-flowing. Absorbs moisture. Non-flammable.

**Stowage factor** is 2 tons per m3

Scrap consists of recyclable materials left over from product manufacturing and consumption, such as parts of vehicles, building supplies, and surplus materials. Unlike waste, scrap can have significant monetary value.

Loose metal scrap is not to be accepted. Scrap is to be either bundled or loaded into big bags, and is only to be accepted provided the container floor/sides and end wall are lined with protective materials e.g. plywood, also a solid bulkhead is to be fitted at the door end.  
If the scrap contains any residue of oil, water etc, and for all used auto/spare parts, in addition to the above protection the container floor has to be covered/protected with plastic sheets. The plastic sheets also have to cover the lower 30 cm of the container sides as well. Containers are allowed to be tilted to a maximum of 15 degrees during loading and unloading. Under no circumstances may the container be placed in an upright position during loading and unloading.

Scrap cargoes are to be surveyed prior to loading to detect the presence of radioactive material.

Contact with water may cause heating and the evolution of flammable and toxic gases, such as hydrogen, ammonia and acetylene. Hydrogen and acetylene have wide ranges of flammability and are readily ignited.

Zinc ashes, dross, skimmings and residues are all reactive in the presence of moisture liberating the flammable gas hydrogen and various toxic gases.

Entry into cargo spaces containing this material should be made only with the main hatches open and after adequate ventilation and when using breathing apparatus.

**Stowage factor** is 0,8 tons per m3.

Electrical equipment includes any machine powered by electricity. They usually consist of an enclosure, a variety of electrical components, and often a power switch

Electrical equipment, radio, television, video, hi-fi equipment and the like are susceptible to shock, heavy handling in transit and impact damage. Particular note should be made of type of packing and suitability to withstand normal transit hazards.

Dependent upon size of unit, the use of heavy cardboard cartons is commonly employed with internal packing of formed polystyrene and plastic sheeting or open-ended bags.

The question of an acceptable form of repair can give rise to problems, particularly when manufacturers’ warranties or guarantees have to be maintained. Wherever possible in new items, unless replacement components can be obtained, it is often more advantageous to agree a fair depreciation allowance with the importer, and for him to retain the equipment as spare parts, or sale on a depreciated basis without manufacturers’ guarantee. This refers to impact damage and extensive water damage.

In the event of water damage, immediate inspection and remedial action is of the utmost priority. If cartons show evidence of water or excess moisture, this does not necessarily indicate damage to contents, particularly when polystyrene and plastic open-ended bags are used for internal packing. Care should, however, be taken in ensuring a thorough check, with testing of apparatus if necessary, and if facilities are available.

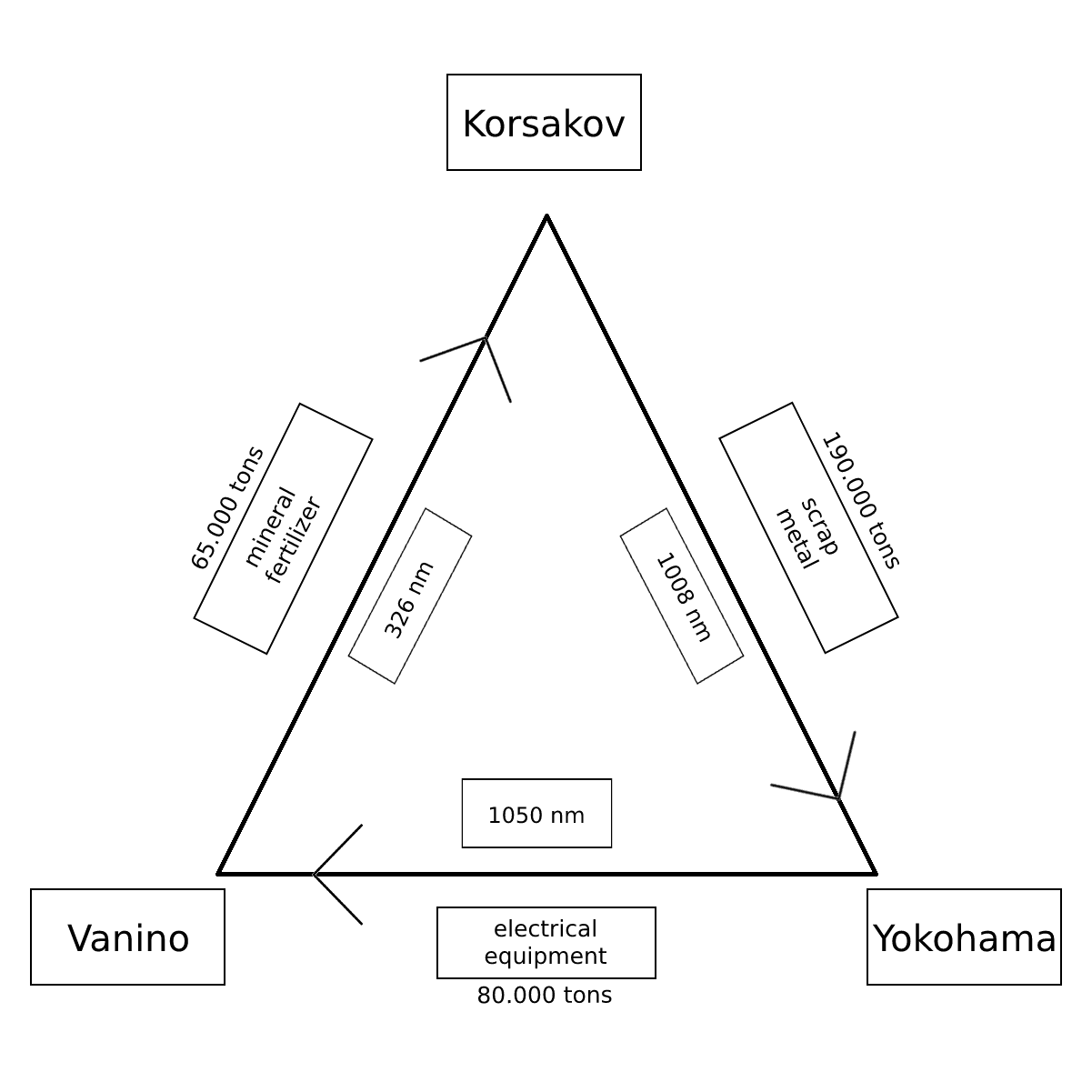
Excess moisture on cartons can have serious concealed effects on electrical equipment. Units so affected should be removed from the packing without undue delay. Contents should be immediately examined for moisture contamination, cleaned as best possible and left for the natural drying-out process within the receiving premises. Dependent on the type of equipment, voltage factor etc., test operation under power may then follow.

One immediate check to determine extent of moisture contamination, where outer carton shows signs of wetting, and later drying, is to examine the binding pins in any enclosed instruction manual.

**Stowage factor** is 2,3 tons per m3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cargo | Cargo class | Package | Package mass | Stowage factor, m3/ton. |
| Ammonia sulphate (mineral fertilizer) | М-30 | Waterproof big bags | 1 | 2 |
| Scrap metal | ММ-Р | Waterproof big bags | 1 | 0,8 |
| Household electrical equipment | Я-250 | Cardboard cartons | 1 | 2,3 |

**2.1.3 Cargo transport characteristics**

****

According to the determining cargo flow, the required specific cargo capacity of the vessel is calculated:

, (m3/ton); , (1)

where is the total maximum volume of cargo in the forward or reverse direction (m3); is the total maximum freight traffic of the forward or reverse direction (t).

,

,

= 190000,

,

= 0,97, (m3/ton); (1)

∑Dч - required tonnage for a given line

where

.

The total cargo flow (the amount of transported cargo on the line) is calculated by the formula:

, tons. (6)

Where – the amount of cargo transported on each direction (tons).

tons.

The length of the line covers the length of all its sections and is determined by the formula:

(7)

where – length of each line section (miles).

= 2384.

Line turnover in ton-miles. The traffic volume indicator does not in itself reflect the planned or completed transport work, for this it is necessary to take into account the length of the path along which the goods were moving. Such a unit is ton-miles performed or ton-mile turnover, which is determined by formula:

. (8)

ton-miles

The average line transportation distance (average transportation distance of 1 ton of cargo) on a given line is the average distance traveled by 1 ton of cargo during sea transportation. The average transportation distance of 1 ton of cargo is a general indicator of the rationality of cargo transportation by all modes of transport, its reduction reduces transportation costs, transportation cycle length, and the cargo cost. Average transportation distance (miles), is determined by the formula:

(9)

= 886, miles

The shift rate of the cargo on the line shows how many times during the voyage the ship changed its average load. In a voyage consisting of one ship passage between two ports, the cruising range of the ship and the average transportation distance of 1 ton of cargo are equal. When a ship makes ballast runs or calls at intermediate ports, the cruising range exceeds the average transportation distance of 1 ton of cargo. The excess of the average line length over the average transportation range of 1 ton of cargo is expressed by the cargo shift rate. It shows how many times with a given system of organization of transportation the average tonnage transportation distance is greater than the average transportation distance of 1 ton of cargo. Numerically, it is equal to 1 or more and is determined by the formula:

. (10)

= 2,69

Line tonnage-miles. The production capabilities of a vessel are determined not only by the mileage, but also by its carrying capacity (tonnage), so the tonnage mileage is determined not only in miles, but also in tonnage-miles according to the formula:

. (11)

.

The net tonnage (tonnage) utilization factor determines the extent to which the vessel's (fleet's) net tonnage is utilized for a voyage or series of voyages. It takes into account the difference in the loading of the ship on separate passages and on separate voyages, as well as ballast runs. The net load capacity utilization factor is determined by the formula:

. (12)

= 0,65

Line intensity factor (tonnage load). The load shift rate, together with the net load capacity utilization factor, determines the intensity of tonnage loading. The tonnage loading intensity indicator is the number of tons of cargo that moves 1 ton of carrying capacity in a voyage, is determined by the formula:

. (13)

Line parameters calculation results are displayed in the following table:

Table 1

Line parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| 335000 | 2384 | 296710000 | 886 | 2,69 | 190000 | 452960000 | 0,65 | 1,75 |

**2.1.4 Selected vessel type basic requirements**