Technical Research of ship launching using airbags

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Abstract: By comparing the traditional ship launching technology with Evergreen innovative "Flexible Launching Technology™", we hope this kind ship launching airbags can be used by more and more shipyards. Sequentially promote the developments of shipbuilding industry under current economic crisis.

Keyword: ship launching, ship launching airbags, shipping airbags, marine airbags, evergreen airbags, Flexible Launching Technology™, Holistic Screw Type Enlacing Technology

General

The ship launching slipway, which spend high investment, is the key construction of shipyard. In order to meet the requirement of high-frequency and moderate tonnage shipbuilding, and innovate traditional ship launching construction and research new type ship launching construction, CSSC issue CB/T 3795-1996 (air bag for ship up to or down to launching way) and CB/T 3837-1998 (Technological requirements for ship upgrading or launching relying on air-bags) as industry standard, which supply the basal criterion. Subsequently, Qingdao Evergreen Shipping Supplies Co., Ltd innovate Flexible Launching technology™, and Holistic Screw Type Enlacing Technology, thereby become the leader of launching technology.

1. The traditional ship launching technology

There are three principal methods of conveying a new ship from building site to water, only two of which are called "launching." Including Gravitational type launching, Floating-out Type Launching, and Mechanical type launching.

1.1 The Gravitational Type Launching Method

This launching method is divided into Longitudinal Oiled Slideway Launching, Longitudinal Steel-Roller Slideway Launching, and Side Oiled Slideway Launching, which are three main gravitational type launching method.

1.1.1 Longitudinal Oiled Slideway launching, whose slipway and slideway is whole launching facilities, is one time-honored and durable launching method.

Before launching, must coat thickness of oil poured on the slideway in order to reduce the friction. Butter oil was used before. Currently, use a different proportion of paraffin wax, stearic acid, and rosin from modulation. Then remove the entire keel pier, side pier and other supporting facilities, make the weight of ship slide into slideway. And then release the anti-slip devices, vessel slides, usually stern first, down and inclined slipway.

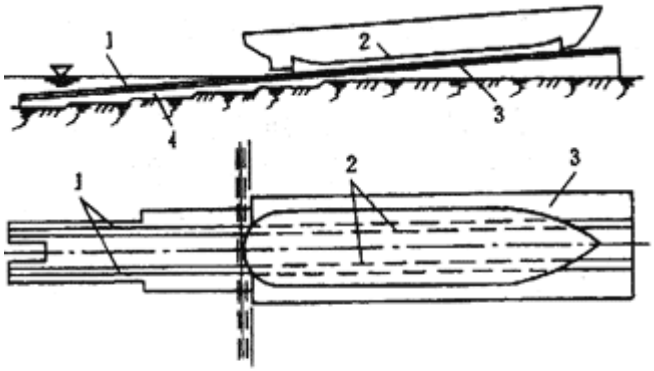
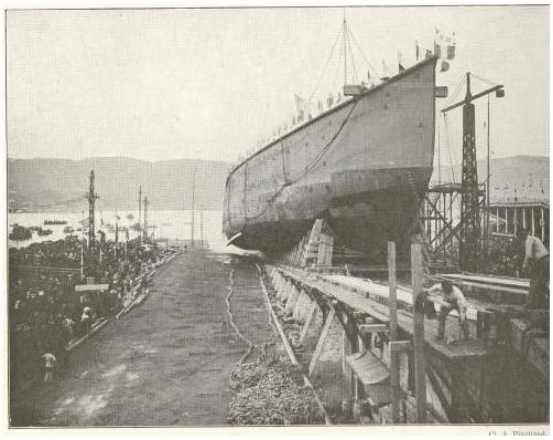


图 8-1-1 纵向油脂滑道

1-下水滑道；2-滑板 ；3-船台；4-滑道基础



This method can be used for the vessels with different tonnage and type. This method has the advantages of simple equipments, low-cost building, and convenient management. But there are some disadvantages, including complicated launching technology; the coating of oil can be influenced by temperature, and oil can pollute water; there is huge front pressure when the ship pivoting; the stroke of ship is very long, and the mooring or turning equipments must be used.

1.1.2 Longitudinal Steel-Roller Slideway Launching

In this way, the steel rollers are used as a substitute for oil as antifriction device, so that the original sliding friction changes into rolling friction, reducing the frictional resistance between skateboard and slideway. The steel rollers can be re-used. This method includes the following equipments, high-intensity steel rollers, the equipments for keeping distance (security device), and steel board. There are 12 steel ball within per square meter security device. There is each layer of steel plate on the wooden slide and slide rails preventing them from being crushed steel balls. There are net bags on the end of chute to receive the balls the security devices.

The advantage of this method include start quickly, small slope of slideway, smaller width between skateboard and slideway, re-useable steel rollers, and the cheaper installation cost and using cost than oiled slideway. And the climate cannot impact the launching; the calculation can be got accurately. But the initial investment is very huge, the skateboards are very bulky.

1.1.3 Side Oiled Slideway Launching

The side launch, whereby the ship enters the water broadside, came into 19th-century use on inland waters, rivers, and lakes, and was more widely adopted during World War II.

The method also includes two types. One kind is the slideway extend into the water, firstly pull the ships on the wedgy skateboards, the launch ship inclined slideway; another kind is the slideway is interruption at the end of vertical wharf, the ship together with the frame, skateboard slide into water, then the ship become steady based on its own buoyancy and stability of the entire floating balance. The height of ship falling is about 1~3 meter.

Because of the usage of many chutes, it causes the different slipping speed, causing the water accident. When the ship fall into the water, it rolls severely so there is higher requirement for the horizontal strength and stability of ships.

1.2 Floating-out Type launching

The third method is float-out, used for ships that are built in basins or drydocks and then floated by admitting water into the dock. Technically, this is not a launch, although sometimes erroneously referred to as such.

There are two kinds of floating docks. One is building floating dock, another is repairing floating dock. The difference is the first type is wide and shallow; the second type is very deep.

Floating-out launching is very simple way. Its safety and technology is very good. And it can effectively overcome the disadvantage of elevation head, reducing the lifting height of cranes; also can avoid the limits for the square-built water area of Gravitational Type Launching Method; can introducing the mechanized operation. Therefore, even though the initial investment is very huge. But it is still the only means of construction of VLCC.

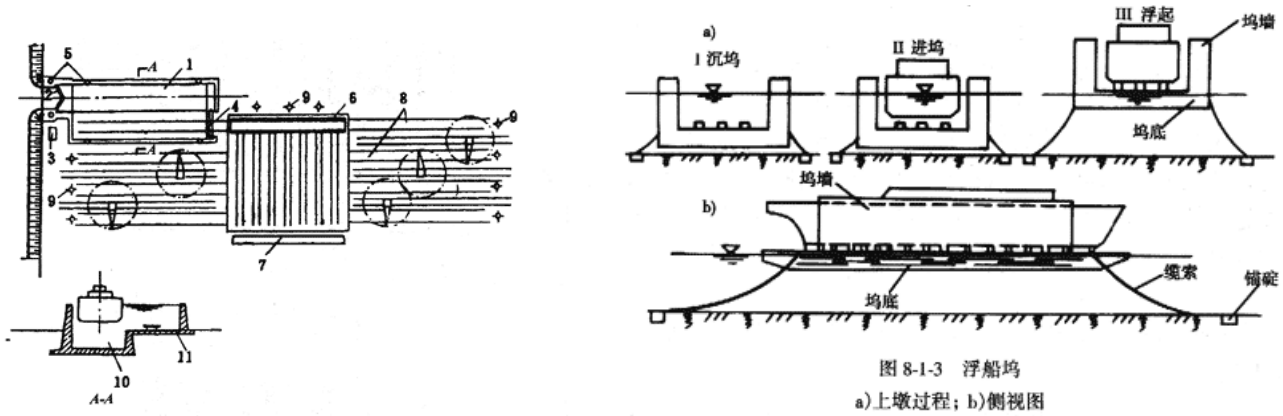


图 8-1-3 浮船坞
a)上墩过程；b)侧视图

1.3 Mechanical Type Launching

Normally, this launching method includes the following ways:

- Longitudinal mechanized slideway launching
- Two points longitudinal mechanized chute launching
- Wedge-shaped mechanized vehicles launching

- Slope change traverse areas mechanized vertical chute launching
- High-low track slide mechanization launching
- Mechanized comb slide into the water
- Lifting ship equipments
- Floating dock into the water

All above launching ways have the the limits in part, such as expensive building or construction fees, expensive maintaince fees, limitable ability for small ship, complicated technology, and so on.

Considering the structure, most of above launching method used the principle of sliding friction to move the ship by the lubricating property of oil. Its mobility and controllable is very bad. Although the machinery type launching improve the mobility greatly, the scope of application is very small, and cannot be used for large vessels. Under this background, the new launching method was innovated by Evergreen engineers, i.e. using the rolling friction to instead of sliding friction. From the physics points of view, rolling friction has a little relationship with gravity. So it provides the advantaged condition for the large vessels.

2. Innovative Flexible Launching Technology

The basic body consists of Evergreen airbags consist of our rubber layers, synthetic-cord-reinforced rubber layers, are kind of a cylindrical airbags with hemispherical heads at the both ends. All of these are vulcanized together, and then compress air inside to enable in to roll. The main method of classification is the layers of airbags. At present the main diameter of airbags include 0.8m, 1.0m, 1.2m, 1.5m, 1.8m and 2.0m type.

All the material of Evergreen airbags is selected as per ISO17357-2002 and CB/T 3795-1996. Meanwhile, all the airbags have got the certification of ISO9001:2000, CCS, Lloyd's.

At present, most of airbags are 6 layers type airbags. The loaded capacity is about 10 tons per square meter. Recently, Qingdao Evergreen shipping Supplies Co., Ltd innovated the high-intensive airbags by the unique "**Holistic Screw Type Enlacing Technology**". The hydrostatic pressure blasting pressure is over 1.2Mpa. Then the loaded capacity is over 28 tons per square meter. Sequentially, evergreen airbags break the record for the launching of hundred thousand tonnage vessels.

The investment of shipyard construction is very expensive. There are some severe limits in the development of small shipyards. So, Flexible Manufacturing Technology are accepted and used by more and more developed countries in order to meet the requirement of quantity production and enhance the strain capacity. So, we can see, based on its excellent adaptive faculty, "Evergreen launching technology by airbags" is deserved to be honored "Flexible Launching Technology".

Now, let's research the practicability and economical efficiency by the follow Launching Project by Ever-Safe Engineering.

The process of Ship Launching using airbags:

Step1. Prepare the launching slipway and related workers.

As per calculation, select and check the appropriate airbags and quantity. Tidy up the launching slipway. Fix the ship by winch and anchors. Prepare all the necessary equipments.

Step2. Taking out all standing blocks under stern and middle one by one, and put in airbags.

The distance between two rows should be confirmed as per the calculation.

Step3. Taking out all standing blocks under the prow. Run the winch and release the cable. Let the ship launch into water.

Step4. After launching, check all the deckhouse to confirm if there is any problem. Meanwhile, retrieving all the airbags.

3. Comparison of traditional launching technology with Evergreen "Flexible Launching Technology™"

The advantage of this Flexible Launching Technology™ includes **Labor-Saving, Time-Saving, Flexible, Economical, and Safety.**

3.1 The ship launching by airbags is one kind of highly innovative and promising technology. It overcomes the defects that small and medium shidyards'capacity is limited by the fixing slideway. Meanwhile, this technology also supplies another way for the shipyard that doesn't have the fixing slideway. On the one hand, it resolves the production problem of single slideway. On the other hand, this technology saves the expensive investment on fixing slideway.

3.2 The whole operation process of this technology is very simple. So, it can save more labors and time. Meanwhile, there isn't any fee of slideway construction, and don't need any infectant oil, and all the airbags can be used many time. So it is very economical. As one kind of recyclable technology, it incarnate the property of circular economy and sustainable development. It can create remarkable social and economic efficiency.

3.3 For the launching of large vessel, because of the property of solidity of slideway and huge buoyancy at the moment when the ship launch into water, vessel can be damaged easily. But our flexible launching technology overcomes this problem by the airbags' flexible.

4. Innovative technology of Evergreen ship launching airbags

At present, Evergreen Flexible Launching Technology™ is widely used by most china shipyard. And this technology also is accepting slowly by more and more foreign shipyard.

Before, there were three key questions. First, it's how to launch the ship with sharp bottomed. Second, it's how to move ship breadthwise. Third, it's how to land the large vessel from water.

Based on the above questions, we found the critical factor, i.e how to improve the intensity of airbags, and augment the contacting area. So we introduce the technology of "Holistic Screw Type Enlacing Technology" and select material as per ISO 17357:2002. One hand, this technology ensures the air-tightness of airbags. On the other hand, it also ensures the intensity for super sharp and super large vessels. For the question of contacting area, we introduce the concept of "Extending Steel Plate", i.e welding one piece steel plate under ship bottom. This technology successfully resolves the problem of transverse moving and sharp bottom. Thus, it enlarges the application area.

For the problem of landing large vessel, we introduce the concept of "Pressure Conversion". It means adjust the pressure within limits after inflating enough air, make it controllable as per the difference of workplace. On the other hand, enlarge the pull force of winches with the help of crane.

5. Foreground

From the above description, we can know Evergreen Flexible Launching Technology is very simple to operation. But we should better stress its extraordinary. Firstly, this technology transfers the launching idea, i.e. rolling friction instead of sliding friction. Secondly, it creates remarkable social and economic efficiency. And resolve the common failing that fixing slideway take up room of shipyard. Finally, so many success projects prove “Evergreen Flexible Launching Technology” is most effective and safety launching method.

Base our research and application, this Evergreen Flexible Launching Technology can be widely used for heavy lifting and conveying, sunken ship salvage and refloatation.

We believe Evergreen Flexible Launching Technology will be more perfect and accepted by more and more world shipyards. This technology will certainly help more and more shipyards, salvage companies, and other maritime companies to cast off the influence of current economic crisis. Consequently, to strove for the early accomplishment of brilliantly development.