Integrated Construction and Installation Method for Upper Process Assembly of Floater

TECHNICAL FIELD

The present invention relates to the field of manufacturing of an offshore/onshore oil or natural gas extraction facility, and in particular to an integrated construction and installation method for an upper process assembly of a floater.

BACKGROUND ART

In the prior art, a floater generally refers to a floating apparatus for extraction, production and storage at a offshore oil or gas field (gas hydrate or other relevant energy sources). Commercially common floating apparatus products include, but are not limited to, forms such as Floating Production Storage and Offloading (FPSO), Floating Liquefied Natural Gas (FLNG) production, storage and offloading apparatus, and Semi-submersible Platform.

A typical floating liquefied natural gas (FLNG) production, storage and offloading apparatus is a floating production apparatus, which is used for exploiting an offshore natural gas field and is located on the ocean by a mooring system. This apparatus has the functions of extracting, processing, liquefying, storing and loading/unloading natural gas, and can achieve the extraction of an offshore natural gas field and transportation of the natural gas when used in combination with a liquefied natural gas (LNG) ship.

Generally speaking, a floating liquefied natural gas (FLNG) production, storage and offloading apparatus is mainly divided into a utilities module and a production process module for liquefied natural gas in the upper part, and a ship body and other auxiliary facilities in the lower part. However, depending on the distance from the shore, changes in the depth of water and the production quantity of liquefied natural gas, the ship body structure in the lower part and the assembly in the upper part may have different forms.

Traditionally, a shipyard is predominantly used to produce ships, while an ocean engineering module factory is mainly used to manufacture process modules of diverse

functionality for the extraction of an oil or natural gas field. The advantages of a shipyard lie in its streamlined operations, which can produce the steel structure of a ship body rapidly, however, it has the disadvantages of a lack of large-scale flat area suitable for the manufacturing of an ocean engineering module and a lack of the corresponding facilities and equipment necessary for ocean engineering. In contrast, an ocean engineering construction yard is capable of producing ocean engineering modules of various different designs but is incapable of mounting the modules onto the ship body.

In the majority of commercially available construction methods, the whole assembly of the utilities module and the production process module for liquefied natural gas (approximately 80 metres long, 60 metres wide, 50 metres high, weighing about 30,000 tons) is divided into 6-10 pieces of smaller sub-assemblies weighing 1,000-5,000 tons each for manufacturing separately. The sub-assemblies are thereafter mounted onto the ship body by floated jacking or another jacking manner, and are then connected to each other and to the ship body. Finally, the whole FLNG apparatus is commissioned and delivered.

However, this commercially conventional approach has the following disadvantages:

1. a long total time period from construction to commissioning;

2. commissioning requiring a large workload and high costs;

3. a large number of risky operations for installation of modules (offshore crane operations up to 20-30 times)

4. many operations at height (at a working height of 20-80 metres); and

5. a long time period for installation and commissioning, and susceptibility to the influence of weather.

In view of this, there is an urgent need for a person skilled in the art to improve the integrated construction and installation method for an upper process assembly of a traditional floater, so as to comply with the development of offshore/onshore oil or natural gas extraction facilities.

SUMMARY OF THE INVENTION

The technical problem to be solved by the present invention is how to overcome the difficulties of a long working period and complex installation in existing integrated construction and installation methods for an upper process assembly of a floater, and to provide an integrated construction and installation method for an upper process assembly of a floater.

The above-mentioned technical problems are solved in the present invention by the following technical solutions:

an integrated construction and installation method for an upper process assembly of a floater, characterized in that the integrated construction and installation method is carried out at a smart yard combining an ocean engineering module factory and a shipyard, and mainly comprises the following steps:

Step S_1, completing the construction of the upper process assembly of the floater, to form a complete utilities module and production process module;

Step S_2, transporting the upper process assembly of the floater as a whole to a final assembly area for integral installation;

Step S_3, mounting the completed utilities module and production process module onto a ship body by means of a jacking system and a sliding system; and

Step S_4, carrying out overall commissioning.

According to one embodiment of the present invention, the smart yard comprises a module manufacturing area, a shipbuilding area, a dock area, a jacking and sliding area, and a commissioning area.

According to one embodiment of the present invention, said step S_1 is carried out in the module manufacturing area.

According to one embodiment of the present invention, said step S_3 consists in transportation to the dock area through a transportation channel of the shipyard.

According to one embodiment of the present invention, said step S_1 further comprises: pre-commissioning and commissioning the utilities module and the production process module.

According to one embodiment of the present invention, hydraulic flat cars are used for transportation in said step S_2.

According to one embodiment of the present invention, said step S_2 further comprises the following steps:

Step S_{21}, splicing the hydraulic flat cars according to a structural layout of the upper process assembly of the floater;

Step S_{22}, driving the hydraulic flat cars by a locomotive to the bottom of the upper process assembly of the floater;

Step S_{23}, the hydraulic flat cars functioning as a whole to jack the upper process assembly of the floater such that the upper process assembly is detached from construction piers; and

Step S_{24}, transporting, by the hydraulic flat cars which carry the upper process assembly of the floater, the upper process assembly to a sliding and jacking area of the dock according to a designed transportation route.

According to one embodiment of the present invention, said step S_3 further comprises the following steps:

Step S_{31}, transporting, by the hydraulic flat cars, the upper process assembly of the floater to a designated sliding and jacking area near the dock;

Step S_{32}, lowering the hydraulic flat car, such that the upper process assembly of the floater gradually lands onto a jacking device, until the upper process assembly of the floater is separated from the hydraulic flat cars;

Step S_{33}, the jacking system starting to operate for gradually jacking the utilities module and the process module until they are flush with the upper surface of the ship body; and

Step S_{34}, locking the jacking system, mounting connecting beams and the sliding system.

According to one embodiment of the present invention, the sliding system employs a hydraulically-driven sliding device, and after step S_{34}, the following steps are performed:

Step S_{35}, adjusting the top of the jacking system, and slipways and the connecting beams on the upper surface of the ship body;

Step S_{36}, turning on hydraulic driving, so that the upper process assembly of the floater starts to slide gradually until the upper process assembly of the floater slides from the jacking system to the ship body; and

Step S_{37}, locking a connecting device between the upper process assembly of the floater and the ship body, and removing the jacking system and the sliding system.

According to one embodiment of the present invention, said step S_4 comprises: structurally connecting the mounted utilities module and production process module to the ship body; bringing pipelines, cables and other systems into communication; and connecting the upper process assembly of the floater to the ship body fully rigidly or partially rigidly via elastic pads.

The positive effects of the present invention lie in:

In the integrated construction and installation method for an upper process assembly of a floater in the present invention, as much work as possible can be arranged in the stage of construction on land, which reduces the workload in installation and commissioning. The whole assembly of the utilities module and production process module for liquefied natural gas can be built, installed, connected and commissioned respectively in one go. Thus the working period, risks, and construction costs of the whole assembly of the utilities module and production process module for liquefied natural gas can be decreased. With the background of currently low international oil and natural gas prices, this would be an excellent way for an oil or natural gas company to cut its costs.

Compared with traditional construction and installation methods, the integrated construction and installation method for an upper process assembly of a floater in the present invention can significantly shorten the working period, decrease the total construction costs, minimize the number of crane operations and works at height, and reduce risks in construction.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other features, properties and advantages of the present invention will become more apparent from the following description of the embodiments with reference to the accompanying drawings, and the same reference numerals in the figures denote the same features throughout, wherein:

FIG. 1 is a schematic diagram of the concept of "integration" in the present invention.

FIG. 2 is a schematic diagram of the main steps and the layout of the smart yard involved in the present invention.

FIG. 3-1 is an elevated view of a ready-to-jack state in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-2 is a side view of a ready-to-jack state in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-3 is an elevated view during jacking in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-4 is a side view during jacking in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-5 is an elevated view of a ready-to-slide state in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-6 is a side view of a ready-to-slide state in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-7 is an elevated view during sliding in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

FIG. 3-8 is a side view during sliding in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

To make the above objects, features and advantages of the present invention more obvious and easy to understand, the present invention will be further described in detail below in conjunction with the accompanying drawings and particular embodiments.

Embodiments of the present invention will now be described in detail with reference to the accompanying drawings. Reference will now be made in detail to preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. The same reference numerals used in all the figures denote identical or similar parts wherever possible.

Furthermore, although the terms used in the present invention are selected from well-known common terms, some of the terms mentioned in the description of the present invention may have been selected by the applicant according to his or her judgement, and the detailed meaning thereof is described in the relevant section described herein.

Furthermore, the present invention must be understood, not simply by the actual terms used but also by the meanings encompassed by each term.

FIG. 1 is a schematic diagram of the concept of "integration" in the present invention. FIG. 2 is a schematic diagram of the main steps and the layout of the smart yard involved in the present invention.

As shown in FIG. 1 and 2, the embodiments of the present invention take the form of a floating apparatus (FLNG) as an example for introducing the integrated construction and installation method for an upper process assembly of the floating apparatus. Of course, the present invention may also apply to floating apparatuses in other forms.

This embodiment is described using a conventional FLNG comprising one utilities module and one production process module, however, of course, it may also apply to FLNG in other forms comprising two or more utilities modules and production process modules.

An integrated construction and installation method for an upper process assembly

of a floater is disclosed in the present invention. The integrated construction and installation method is carried out at a smart yard combining an ocean engineering module factory and a shipyard, and the method mainly comprises the following steps:

Step S1, the construction of the upper process assembly of the floater is completed, to form a complete utilities module and production process module.

In this embodiment, an ocean engineering module factory and a shipyard are combined and retrofitted in an intelligent manner, so that the functions of the ocean engineering module factory and the shipyard are organically combined. The integrated site is divided into five areas, i.e. a module manufacturing area, a shipbuilding area, a dock area, a sliding and jacking area, and an overall commissioning area. Work can either be done separately in the five areas, taking full advantage of each of the areas, or the operations in these areas can be carried out cooperatively, remedying the shortcomings of each of the areas. The integrated site is referred to as a smart yard.

The above-mentioned step S1 is carried out in the module manufacturing area. All the construction areas in the yard are subjected to heavy tamping, so the loading capacity thereof can reach up to 50 MT/m2, while the quay and the bases of slipways are piled, so as to allow a module of a maximum individual weight of about 30,000 tons to be loaded onto the ship. The yard is provided with facilities such as a structure workshop, a pipeline workshop, a sand-blasting and painting workshop, and a final assembly workshop for individual modules. Thus "one-stop" manufacturing of the whole assembly of the utilities module and production process module for liquefied natural gas can be achieved. Finally, the utilities module and the production process module need to be pre-commissioned and commissioned.

Step S2, the upper process assembly of the floater is transported as a whole to a final assembly area for integral installation.

hydraulic flat cars are used for transportation in said step S2. The hydraulic flat cars are controlled intelligently using a hydraulic link. For example, the cars can be flexibly joined and combined into one unit with 6 axes. A joined convoy can be rotated 360 degrees and ensure the safety during transportation. The height at the

middle of the car is 1.5 metres and the hydraulic travel range is plus/minus 0.3 metre. In this embodiment, 1,000 axes can be used, with a maximum weight load of 48,000 tons and a maximum pressure on the ground of 10 MT/m2.

Furthermore, said step S2 further comprises the following steps:

First, the hydraulic flat cars are spliced according to a structural layout of the upper process assembly of the floater. For example, the cars are joined in 16 columns, with 72 axes in each column.

Then the hydraulic flat cars are driven by a locomotive to the bottom of the upper process assembly of the floater.

Thereafter the hydraulic flat cars function as a whole to jack the upper process assembly of the floater such that the upper process assembly is detached from construction piers.

Finally the upper process assembly is transported, by the hydraulic flat cars which carry the upper process assembly of the floater, to a sliding and jacking area of the dock according to a designed transportation route.

Step S3, the completed utilities module and production process module are mounted onto a ship body by means of a jacking system and a sliding system.

The jacking and sliding are carried out in the shipbuilding area, and the transportation to the dock area is realised by passing through a transportation channel of the shipyard.

FIG. 3-1 is an elevated view of a ready-to-jack state in the integrated construction and installation method for an upper process assembly of a floater in the present invention. FIG. 3-2 is a side view of a ready-to-jack state in the integrated construction and installation method for an upper process assembly of a floater in the present invention. FIG. 3-3 is an elevated view during jacking in the integrated construction and installation method for an upper process assembly of a floater in the present invention. FIG. 3-4 is a side view during jacking in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

As shown in FIG. 3-1 to 3-4, the use of the jacking system specifically comprises

the following steps:

First, the upper process assembly of the floater is transported by the hydraulic flat cars to a designated sliding and jacking area near the dock.

Then the hydraulic flat cars are lowered, such that the upper process assembly of the floater gradually lands onto a jacking device, until the upper process assembly of the floater is separated from the hydraulic flat cars.

Thereafter the jacking system starts to operate for gradually jacking the utilities module and the production process module until they are flush with the upper surface of the ship body. The utilities module and the production process module, which are an assembly of the utilities module and the production process module for liquefied natural gas and weigh more than 30,000 tons, are jacked to a height of more than 20 metres.

Finally, the jacking system is locked, and connecting beams and the sliding system are mounted.

FIG. 3-5 is an elevated view of a ready-to-slide state in the integrated construction and installation method for an upper process assembly of a floater in the present invention. FIG. 3-6 is a side view of a ready-to-slide state in the integrated construction and installation method for an upper process assembly of a floater in the present invention. FIG. 3-7 is an elevated view during sliding in the integrated construction and installation method for an upper process assembly of a floater in the present invention. FIG. 3-8 is a side view during sliding in the integrated construction and installation method for an upper process assembly of a floater in the present invention.

As shown in FIG. 3-5 to 3-8, the sliding system preferably employs a hydraulically-driven sliding device. The use of the sliding system specifically comprises the following steps:

First, the top of the jacking system, and slipways and the connecting beams on the upper surface of the ship body are adjusted.

Then hydraulic driving is turned on, so that the upper process assembly of the floater starts to slide gradually until the upper process assembly of the floater slides

from the jacking system to the ship body.

Finally, a connecting device between the upper process assembly of the floater and the ship body is locked, and the jacking system and the sliding system are removed.

Step S4, carrying out overall commissioning.

In a dry dock, the mounted utilities module and production process module for liquefied natural gas are structurally connected to the ship body, and pipelines, cables and other systems are brought into communication. The assembly is connected to the ship body partially rigidly via elastic pads.

When the connection is complete, water is filled in the dry dock, and the floating liquefied natural gas (FLNG) production, storage and offloading apparatus is dragged to a commissioning quay for mooring. Then a liquefied natural gas (LNG) transportation ship approaches the floating liquefied natural gas (FLNG) production, storage and offloading apparatus for feeding liquefied natural gas (LNG) to the floating liquefied natural gas (FLNG) production, storage and offloading apparatus, so as to carry out a final trial production. When the construction and commissioning for the floating liquefied natural gas (FLNG) production, storage and offloading apparatus is finally finished, the apparatus travels out of the shipyard for final delivery.

It can be seen from the description of the above method steps that the embodiments of the present invention take the form of floating apparatus (FLNG) as an example for introducing the integrated construction and installation method for an upper process assembly of the floating apparatus. Other products of floating apparatuses including, but not limited to, the forms of Floating Production Storage and Offloading (FPSO), Floating Liquefied Natural Gas (FLNG) production, storage and offloading apparatus, Semi-submersible Platform, etc. fall within the scope of protection of the present invention.

The embodiments of the present invention take a common deep water FLNG comprising two utilities modules and production process modules as an example for introducing the integrated construction and installation method for an upper process assembly of the floating apparatus. However, depending on the distance from the

shore, changes in the depth of water and the production quantity of the liquefied natural gas, the ship body structure in the lower part and the assembly in the upper part of the FLNG may also have different forms. Therefore, integrated construction and installation methods for an upper process assembly of FLNG of other forms also fall within the scope of protection of the present invention.

The method created in the present invention may drive changes in basic design concepts of FLNG and other floating apparatuses, and those changes in basic design concepts or basic designs for achieving integration of modules on the basis of the concept of the inventive method also fall within the scope of protection of the present invention.

The present invention has high requirements for the capability of the construction site, e.g. for an assembly of a utilities module and a production process module for liquefied natural gas having a weight of 30,000 tons, a yard which at least occupies a 400 metre × 400 metre area and possesses an ability of ocean engineering manufacturing, a dock which at least occupies a 500 metre × 100 metre area and is equipped with a 500 metre × 100 metre dock platform, and a transportation channel which has at least a width of 80 metres and a load capacity of 15 tons per square metre are required. Therefore a common practical implementation of this embodiment would be: dividing the whole assembly of a utilities module and a production process module for liquefied natural gas having a weight of about 30,000 tons into multiple (2 or more) sub-assemblies for construction and installation. The method, in which the whole assembly of a utilities module and a production process module for liquefied natural gas is divided, according to the capability of the yard itself, into multiple sub-assemblies which are then separately constructed, jacked, slid and installed, also falls within the scope of protection of the present invention.

The connection between the assembly and the ship body may be fully rigid or partially rigid or other possible manners, depending on different oceanic and inland environmental conditions. Such changes in structural connections also fall within the scope of protection of the present invention.

The mooring system of the floating apparatus may also have different forms, depending on different oceanic and inland environmental conditions. Such changes in the mooring system also fall within the scope of protection of the present invention.

In the present invention, hydraulic flat cars are used in the method of transportation from the module manufacturing area to the final assembly area near the dock. Depending on the distance of transportation, the means of transportation used can also be by dragging, by sliding, via an air cushion or other forms. Such changes in the transportation method or in the hydraulic flat car also fall within the scope of protection of the present invention.

In the present invention, the jacking used is by a multi-point hydraulic stepwise jacking method, in which a hydraulic jack directly acts on the assembly. Common methods for elevating the assembly include an entirely stepwise elevation method in which the assembly is directly acted on, and methods for jacking or elevating the assembly indirectly through a mounted jacking beam, etc. Such changes in the jacking method or in the jacking device also fall within the scope of protection of the present invention.

The methods of transportation and jacking used in the present invention involve the hydraulic flat car transporting into place, then the hydraulic jack acting directly to jack the assembly, after being jacked to a certain height, a slipway beam being mounted, and finally the slipway beam and the assembly being jacked together. The mounting of the slipway beam can be finished before or after the transportation with the flat cars, and the corresponding procedures will change accordingly. Such changes in the jacking steps or procedures caused by the different installation sequences of the slipway beam or other equipment or facilities during the transportation and jacking also fall within the scope of protection of the present invention.

In the present invention, the initial position for jacking is relatively high (> 3.5 metres), so there is also the possibility that a groove is dug to a certain depth at the jacking location, in which the jacking device is placed, so as to reduce the initial jacking height of the whole assembly. Such changes due to the improvement in the initial

height of jacking also fall within the scope of protection of the present invention.

The sliding method used in the present invention is a hydraulically-driven sliding method, in which the assembly slides directly hydraulically. In addition to hydraulically-driven methods, dragging is also an ordinary method for moving the assembly. Therefore, such changes in the sliding method or in the sliding device also fall within the scope of protection of the present invention.

During the process of jacking and sliding, according to the load bearing force of the dock, the strength of the ship body or other conditions, a certain amount of water will be filled in the dock to increase the buoyancy of the ship body. Such changes due to the variation of forces exerted on the ship body caused by filling water also fall within the scope of protection of the present invention.

Of course, it is possible that a dry dock is not available for some sites. Therefore, in the present invention, a floating dock method can be used, or the lower ship body can be directly docked at the quay while providing an external load-adjusting system. Then the jacking and sliding are carried out at the quay. Such changes in the docking position of the ship body due to the limitation of the dock also fall within the scope of protection of the present invention.

The present invention does not describe concrete positions where the commissioning is performed after the construction of the assembly and where the overall commissioning is performed after the installation is completed. The commissioning after construction can be performed in the module manufacturing area, or in the sliding and jacking area, or in another area. The overall commissioning after installation can be performed at a quay in the vicinity of the site, or in open water near the shipyard, or in another area. Therefore, such changes in the site for commissioning or in the commissioning method also fall within the scope of protection of the present invention.

The area of the site, the capacity of the site, the size of the dock, the size of the quay, etc. in the present invention are determined according to the specifications of the assembly of a utilities module and a production process module for liquefied natural gas.

The changes in corresponding site, dock, and quay according to specific requirements of products also fall within the scope of protection of the present invention.

In the present invention, it is possible to erect or retrofit a dock equipped with a dock platform having manufacturing ability in terms of ocean engineering, corresponding to the particular method to be used, i.e. a construction yard customised for floating apparatus products. Such changes in erection or retrofitting which meet the requirements of the above-stated method steps (Onshore MAX) also fall within the scope of protection of the present invention.

In summary, the integrated construction and installation method for an upper process assembly of a floater in the present invention has the following advantages:

1. An inland manufacturing mode with integral construction and integral commissioning is used. The mode requires the management of only one site, and reduces the costs for client management personnel, the occupied area of the construction, and the number of scaffolds built. This mode has a high concentration of construction personnel, and facilitates production and safety management. All the production systems are commissioned as a whole, so that a scenario where the sub-systems are commissioned repeatedly occurs less frequently.

2. The assembly is installed by sliding and jacking. The sliding and jacking are carried out in the dock area and all the operations are stationary without the influence of ocean tides and currents. The procedure will not be influenced by the radius of floating cranes and the crane capability. There is no offshore crane work at height, which reduces the risks in operation. Since all the operations can be done in areas on land, work is more stable and the risks can be better controlled than in offshore work.

3. The connections are achieved through a small number of structural pipeline connections during the commissioning procedure, thus requiring less commissioning. This reduces the amount of transportation of personnel and machines from land to the ship. In the method of the present invention, almost all the commissioning work is done on land, while much less work has to be done on board, thereby effectively reducing the risks of work at height.

4. Later stage of construction is substantially shortened.

It can be seen that the main principle of the integrated construction and installation method for an upper process assembly of a floater in the present invention lies in that: the whole assembly of a utilities module and a production process module for liquefied natural gas (of 80 metres long, 60 metres wide, 50 metres high, and weighing 30,000 tons) is integrally constructed and commissioned in a construction yard, then the completed utilities module and production process module are installed on the ship body by means of a jacking and sliding system, and finally the commissioning and delivery of the whole FLNG is completed.

In the integrated construction and installation method for an upper process assembly of a floater in the present invention, the key concept lies in the integrated construction and installation, where as much work as possible is arranged in the stage of construction on land, reducing the workload for installation and commissioning. The whole assembly of the utilities module and production process module for liquefied natural gas can be built, installed, connected and commissioned respectively in one go. Thus the working period, risks, and costs for construction of the whole assembly of the utilities module and production process module for liquefied natural gas can be decreased. In the environment of the currently low international oil and natural gas prices, this would be an excellent way for an oil or natural gas company to cut its costs.

While the particular embodiments of the present invention have been described, a person skilled in the art shall understand that these are merely illustrative, and that the scope of protection of the present invention is defined by the appended claims. Various alterations or modifications to these embodiments can be made by a person skilled in the art without departing from the principle and essence of the present invention; however, these alterations and modifications all fall within the scope of protection of the invention.

Claims

1. An integrated construction and installation method for an upper process assembly of a floater, characterized in that, the integrated construction and installation method is carried out at a smart yard combining an ocean engineering module factory and a shipyard, and mainly comprises the following steps:

Step S_1, completing the construction of an upper production process assembly of the floater, to form a complete utilities module and production process module;

Step S_2, transporting the upper production process assembly of the floater as a whole to a final assembly area for integral installation;

Step S_3, mounting the completed utilities module and production process module onto a ship body by means of a jacking system and a sliding system; and

Step S_4, carrying out overall commissioning.

2. The integrated construction and installation method for an upper process assembly of a floater according to claim 1, characterized in that, the smart yard comprises a module manufacturing area, a shipbuilding area, a dock area, a jacking and sliding area, and an overall commissioning area.

3. The integrated construction and installation method for an upper process assembly of a floater according to claim 2, characterized in that, said step S_1 is carried out in the module manufacturing area.

4. The integrated construction and installation method for an upper process assembly of a floater according to claim 2, characterized in that, said step S_2 consists in transportation to the dock area through a transportation channel of the shipyard.

5. The integrated construction and installation method for an upper process

assembly of a floater according to claim 3, characterized in that, said step S_1 further comprises: pre-commissioning and commissioning the utilities module and the process module.

6. The integrated construction and installation method for an upper process assembly of a floater according to claim 5, characterized in that, hydraulic flat cars are used for transportation in said step S_2.

7. The integrated construction and installation method for an upper process assembly of a floater according to claim 6, characterized in that, said step S_2 further comprises the following steps:

Step S_{21}, splicing the hydraulic flat cars according to a structural layout of the upper process assembly of the floater;

Step S_{22}, driving the hydraulic flat cars by a locomotive to the bottom of the upper process assembly of the floater;

Step S_{23}, the hydraulic flat cars functioning as a whole to jack the upper process assembly of the floater such that the upper process assembly is detached from construction piers; and

Step S_{24}, transporting, by the hydraulic flat cars which carry the upper process assembly of the floater, the upper process assembly to a sliding and jacking area of the dock, according to a designed transportation route.

8. The integrated construction and installation method for an upper process assembly of a floater according to claim 6, characterized in that, said step S_3 further comprises the following steps:

Step S_{31}, transporting, by the hydraulic flat cars, the upper process assembly of the floater to a designated sliding and jacking area near the dock;

Step S_{32}, lowering the hydraulic flat car, such that the upper process assembly of the floater gradually lands onto a jacking device, until the upper process

assembly of the floater is separated from the hydraulic flat cars;

Step S_{33}, the jacking system starting to operate for gradually jacking the utilities module and the process module until they are flush with the upper surface of the ship body; and

Step S_{34}, locking the jacking system, mounting connecting beams and the sliding system.

9. The integrated construction and installation method for an upper process assembly of a floater according to claim 6, characterized in that, the sliding system employs a hydraulically-driven sliding device, and after step S_{34}, the following steps are performed:

Step S_{35}, adjusting the top of the jacking system, and slipways and the connecting beams on the upper surface of the ship body;

Step S_{36}, turning on hydraulic driving, so that the upper process assembly of the floater starts to slide gradually until the upper process assembly of the floater slides from the jacking system to the ship body; and

Step S_{37}, locking a connecting device between the upper process assembly of the floater and the ship body, and removing the jacking system and the sliding system.

10.The integrated construction and installation method for an upper process assembly of a floater according to claim 6, characterized in that, said step S_4 comprises: structurally connecting the mounted utilities module and production process module to the ship body; bringing pipelines, cables and other systems into communication; and connecting the upper process assembly of the floater to the ship body fully rigidly or partially rigidly via elastic pads, depending on the oceanic environmental conditions where the floater is to be located.