

A METHOD OF PREPARING A DRY BULK CARRIER

This invention relates to a method of preparing a dry bulk carrier. More particularly, it relates to a method of preparing a dry bulk carrier for sand transportation and
5 fluidized unloading.

When filling in sea areas in order to gain land, oftentimes large amounts of mass are required. According to prior art, so-called self-unloading dredgers TSHD ("Trailing Suction Hopper Dredgers") are commonly used. During the transport
10 from the loading site to the unloading site, the mass is located in silo-like compartments in the vessel. The mass may be unloaded by opening the bottom of the vessel, for example by virtue of the hull being formed in two parts structured in a manner allowing them to be moved relative to each other.

15 EP-document 0677618 discloses a vessel having bottom hatches.

However, vessels of the type mentioned are not particularly suitable for carrying large quantities of mass over longer distances and not, in particular, when transportation across open sea areas comes into question. The reason for this is
20 related to economy, given that these vessels are relatively expensive to build and operate, and also due to their relatively limited carrying capacity.

It is known to fluidize the mass before and during unloading.

As such, US patent 3445008 describes a method and device wherein the lower portion of the hold of the vessel is filled with water prior to pumping out water and mass.

It is known, from US patent 4033470, to use nozzles and water
5 under pressure to fluidize the cargo.

Transportation of mass in holds generally requires that the hold must be closed, and that the cargo must be classified as dry during transportation in the open sea.

The use of dry bulk carriers for carrying dredged mass has
10 been proposed, and patent application NO 19986101 describes an unloading device to be placed on the surface of the cargo, the device of which is structured in a manner allowing it to fluidize and pump out the cargo. However, the unloading capacity of such a solution has proven insufficient.

15 The object of the invention is to remedy or reduce at least one of the disadvantages of the prior art.

In accordance with the invention, the object is achieved by virtue of the features disclosed in the following description and in the subsequent claims.

20 A method of preparing a dry bulk carrier for sand transportation and fluidized unloading is provided, wherein the method comprises disposing within a utility hold, fluidizing pipes having inflow openings and also a slurry inlet for fluidized sand, wherein the method further include
25 disposing a slurry pump connected between the slurry inlet and an unloading pipe where the slurry pump is placed in a hold adjacent to the utility hold.

The method may further include disposing a slurry inlet in a bulkhead between holds.

Thus slurry may be unloaded from a utility hold of the dry bulk carrier without having to substantially alter the layout of the vessel.

5 The method may further include disposing, in a hold adjacent to the utility hold, a water pump to be connected between a water inlet and the fluidizing pipe.

By virtue of disposing the pumps in an adjacent hold, the pumps are located at a level of height near the floor of the utility hold. Simultaneously, the slurry pump may be
10 positioned near the slurry inlet. This reduces cavitation, which would otherwise take place at a substantial degree in the pumps. The outflow of slurry to the slurry pump is facilitated by virtue of the static pressure from the sand, which is located above the slurry in the utility hold,
15 creating a pressure on the slurry.

During unloading, water may flow in from the water inlet and through the inflow openings, which may be comprised of nozzles, so as to fluidize the sand located closest to the floor of the utility hold - frequently termed the tank top.
20 If desirable, fluidizing pipes having inflow openings may also be disposed on the walls of the utility hold, or at different levels of height in the utility hold.

In order to further improve the fluidizing of the sand, the method may also comprise disposing air injection pipes in the utility hold, preferably near the floor thereof. The air
25 injection pipes may be provided with air injection openings, such as nozzles. The air injection pipes are connected to a compressor, typically via a pressure tank. Experiments have proven that water-fluidized sand obtains better fluidity by
30 virtue of mixing some air into the fluidized sand.

A dry bulk carrier may not be filled up with sand in all the

holds, given that the carrying capacity of the dry bulk carrier would be exceeded. For this reason, it is also appropriate to use e.g. every other hold for technical equipment which, in addition to the pumps and a potential
5 compressor, may comprise valves and control components. In order to be able to adjust the specific gravity of the fluidized sand before entering into the slurry pump, injection pipes for water to the slurry pipe may also be disposed on the inlet side of the slurry pump. The water may
10 be supplied from the water pump or from a sea chest in the hull.

In general, the equipment in one hold may serve two adjacent holds.

The fluidized material may be unloaded by allowing it to flow
15 into the slurry inlet and onwards via the slurry pump and the unloading pipe.

The method may further comprise allowing the unloading pipe to end outside the dry bulk carrier when the sand is to be unloaded from the dry bulk carrier, or connecting the
20 unloading pipe to a transport pipe when the fluidized sand is to be delivered at a distance from the dry bulk carrier, for example onshore.

A ship for transportation of sand is normally loaded with fluidized or very wet sand, typically excavated from the
25 seabed near the loading site. The sand must be drained in order to be classified as dry during the transport.

The method may comprise disposing at least one drainage column for drainage of the sand in the utility hold. A drainage column of this type may be comprised of a pipe
30 having a number of openings in the pipe wall along the pipe, each opening being screened in such a way that water may

enter through the opening, whereas settled sand covers the screen and thus prevent significant quantities of sand from entering into the drainage column.

The method may further comprise connecting the drainage
5 column to the slurry pump for pumping out water from the surface of the sand.

The use of a dry bulk carrier preferably having at least three holds and prepared in accordance with the invention for transportation of sand across the open sea allows for a
10 substantial reduction in time and costs for transportation and unloading of sand.

An example of a preferred method and embodiment is described in the following and is depicted in the accompanying drawings, where:

15 Fig. 1 shows, in cross-section, a dry bulk carrier in accordance with the invention during loading;

Fig. 2 shows a plan view of a segment of the hold of the dry bulk carrier;

Fig. 3 shows, in perspective, details of the utility hold
20 of the dry bulk carrier, wherein the extent of the utility hold is indicated by means of dashed lines; and

Fig. 4 shows, on a larger scale, a section through a drainage column.

25 In the drawings, the reference numeral 1 represents a dry bulk carrier comprising several holds 2, at least one thereof being used as a utility hold 4.

In fig. 1, the dry bulk carrier 1 is moored next to a dredger

6, where sand in fluidized form flows from the dredger 6 and into the utility hold 4 via a filling pipe 8.

The utility hold 4 of the dry bulk carrier 1, near the floor - tank top - thereof, is provided with a number of fluidizing pipes 10 having inflow openings 12. The fluidizing pipes 10 extend horizontally in the longitudinal direction of the dry bulk carrier 1 and are connected to a manifold 14. Via a first water valve 16, the manifold 14 is connected to a water pump 18 that receives water from a water inlet 20, see figure 2. The water inlet 20 may comprise a sea chest (not shown). The water pump 18 is positioned in a hold 2 adjacent to the utility hold 4 and is designed in a manner allowing it supply water, via a second water valve 22, to another adjacent utility hold 4. In figure 2, the second water valve 22 is hidden underneath the water pump 18.

A portion of the fluidizing pipes 10 is placed on the walls 24 of the utility hold 4.

A number of air injection pipes 26 having air injection openings 28 are disposed near the floor of the utility hold 4. The air injection pipes 26 communicate with a pressure tank 30 located in an adjacent hold 2 relative to the utility hold 4.

In a bulkhead 32 between the hold 2 and the utility hold 4 a slurry inlet 34 is positioned. Via the slurry inlet 34 and a slurry valve 36 the utility hold 4 is connected to the inlet of a slurry pump 38. The slurry pump 38, which is placed in a hold 2 adjacent to the utility hold 4, is connected to an unloading pipe 40. The unloading pipe 40 ends in the sea next to the dry bulk carrier 1.

An intermediate pipe 42 is connected between the manifold 14 and the inlet of the slurry pump 38. The aim is to be able to

adjust the specific gravity of the fluidized sand before entering into the slurry pump 38 and by supplying additional water via the intermediate pipe 42.

Three drainage columns 44 are disposed in the utility hold 4.

5 The drainage columns 44 are connected, at their lower portions, to a drainage pipe 46 which, via a drainage valve 48, is connected to the slurry pump 38.

The drainage columns 44 comprise a pipe 50 having a number of openings 52 in the pipe wall along the longitudinal extent
10 thereof, see figure 4. A screen 54, which is tight at the top and open at the bottom, surrounds the pipe 50 at the openings 52, whereby an annular space 56 is formed between the screen 54 and pipe 50.

Water may flow into the annular space 56 and onwards into the
15 pipe 50 via the openings 52, whereas sand settling around the screen 54 will seal the annular space 56 at the bottom as the utility hold 4 is being filled. Excess water 58 located above the sand 60, see figure 1, must therefore exit via openings 52 higher up on the drainage column 44.

20 During loading of the dry bulk carrier 1, when fluidized sand flows into the utility hold 4 via the filling pipe 8, the sand 60 settles in the utility hold 4. The slurry valve 36 is closed and the drainage valve 48 is open. As described above, the excess water 58 is drained via the drainage columns 44,
25 drainage pipe 46 and slurry pump 38 and into the sea via the unloading pipe 40.

Before unloading of the dry bulk carrier 1 is to take place, the first water valve 16 is opened, the drainage valve 48 is closed, and the slurry valve 36 is opened.

30 Upon starting the water pump 18, water flows from the water

inlet 20 and via the water pump 18, the first water valve 16,
the manifold 14, the fluidizing pipes 10 and the inflow
openings 12 and into the sand 60, whereby the part of the
sand located closest to the inflow openings 12 is fluidized
5 and forms a slurry.

Upon starting the slurry pump 38, the fluidized sand flows
via the slurry inlet 34, the slurry valve 36 and the slurry
pump 38 onto the unloading pipe 40.

If desirable, air is supplied to the fluidized sand from the
10 pressure tank 30 via the air injection pipes 26 and the air
injection openings 28.

C l a i m s

1. A method of preparing a dry bulk carrier vessel (1) for transportation of sand in a water drained state within a utility hold (4) of the carrier vessel and for
5 unloading the sand in a fluidized state from the utility hold (4), the method comprising the unloading features:
- a) providing water supply to a water pump (18) via a water inlet (20), the water pump (18) delivering water
10 to the drained sand (60) in the utility hold (4) via a water manifold (14) to sand fluidizing pipes (10) having openings (12) to enable influx of water into the sand (60) to fluidize the sand closet thereto to form a slurry of water and sand, and
- 15 b) unloading the fluidized sand from the utility hold (4) by activation of a slurry pump (38) being arranged in a hold (2) adjacent to the utility hold (4), and to allow fluidized sand to flow to the unloading pipe (40) via a slurry inlet (34) and the slurry pump (38), the
20 slurry inlet (34) being disposed in a bulkhead (32) between mutually adjacent holds (2, 4).

2. The method according to claim 1, further wherein the water is delivered into the sand (60) via the sand fluidizing pipes (10, 12) located at a bottom region of the utility hold (4).
- 5 3. The method according to claim 2, further wherein the water is delivered into the sand (60) via the sand fluidizing pipes (10, 12) located at side wall regions of the utility hold (4).
- 10 4. The method according to claim 1, 2 or 3, further wherein pressurized air is supplied into the water fluidized sand (60) via air injection pipes (26) having air injection opening (28), the air injection pipes (26) being located at a bottom region of the utility hold (4).

5. The method according to claim 1, further wherein specific gravity of the fluidized sand (60) before its entry to the slurry pump (38) is adjusted through supplying water from the water manifold (14) to an inlet pipe of the
5 slurry pump (38) by means of an intermediate pipe (42) connected between the water manifold (14) and the inlet pipe.
6. A system installed in a dry bulk carrier vessel (1) for transportation of sand in a water drained state within a
10 utility hold (4) of the carrier vessel and for unloading the sand in a fluidized state from the utility hold (4), the system comprising unloading aid means; wherein the unloading aid means include:
- a water inlet (20) to a water pump (18), the water
15 pump (18) being connected via a water manifold (14) to sand fluidizing pipes (10) having openings (12) capable of delivering water to the drained sand (60) in the utility hold (4) to fluidize the sand (60) closest thereto to form a slurry of water and sand, and
 - 20 - a slurry pump (38) being arranged in a hold (2) adjacent to the utility hold (4), further being connected to a slurry inlet (34) being disposed in a bulkhead (32) between mutually adjacent holds (2, 4), and to an unloading pipe (40).
- 25 7. The system according to claim 6, further wherein the sand fluidizing pipes (10, 12) are located at a bottom region of the utility hold (4).
8. The system according to claim 7, wherein sand fluidizing
30 pipes (10, 12) are also located at side wall regions of the utility hold (4).

9. The system according to claim 6, 7 or 8, further wherein
air injection pipes (26) having air injection openings
(28) are located at a bottom region of the utility hold
(4) to enable supply of pressurized air into the water
5 fluidized sand (60).
10. The system according to claim 6, wherein the unloading
pipe (40) is connected to a conveying pipe.
11. The system according to claim 6, wherein an intermediate
pipe (42) is connected between the water manifold (14)
10 and an inlet pipe to the slurry pump (38) to adjust
specific gravity of the fluidized sand (60) before its
entry to the slurry pump (38) through the inlet pipe.
12. Usage of a dry bulk carrier vessel (1) comprising a
system according to any one of claims 6 - 11 for
15 transporting the sand across open sea, and unloading the
sand.