Internship Report

Design and construction of a spray pontoon and maintenance of HAM 310

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Van Oord Marine ingenuity

Van Oord Dredging and Marine Contractors

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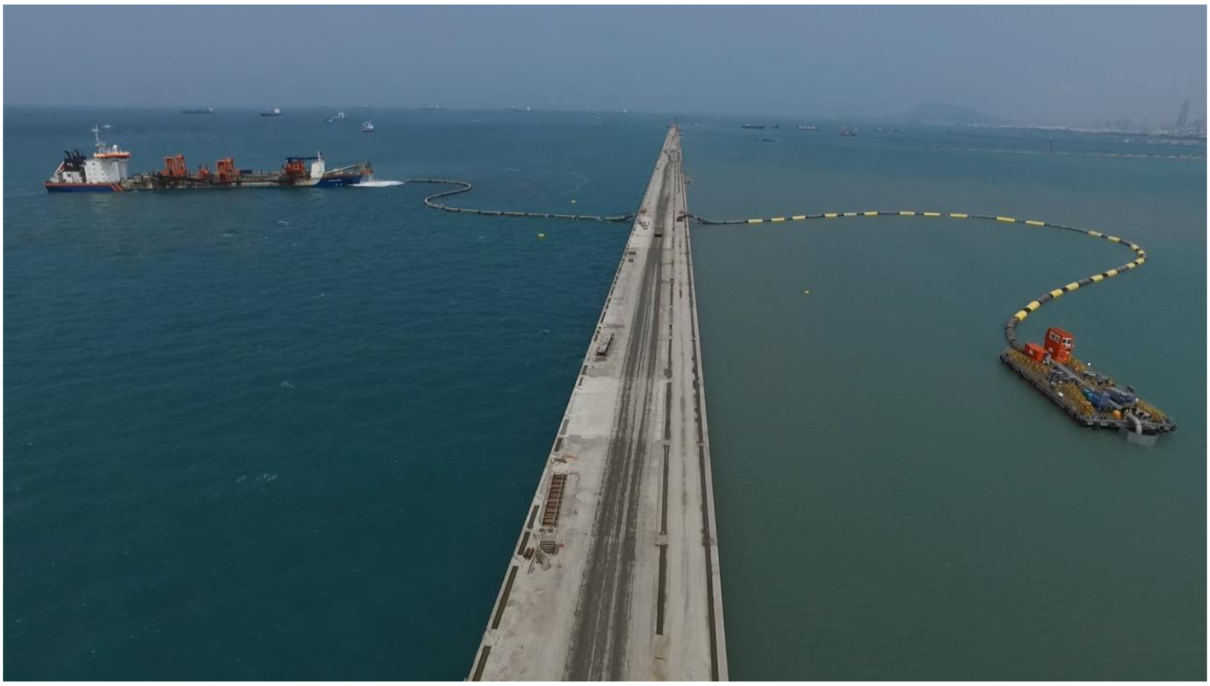
Preface

This report functions to complete my internship at Van Oord as part of the Master Mechanical Engineering at the University of Twente.

This report is the result of my three-month internship in Singapore.

I would like to thank my supervisors Arend Feije and Wouter van Hof for supervising me during my internship in Singapore. Furthermore, I would like to thank Jan Tilman for his guidance at the beginning of my internship in the Netherlands.



Abstract

This report is the result of my internship with Van Oord in Singapore. Van Oord is a leading contractor for dredging, marine engineering and offshore projects. The internship consisted of two parts: designing of a spray pontoon and supervising the maintenance of the HAM 310. A spray pontoon is used to discharge dredged material at a particular location in a controlled way. The main tasks for designing the spray pontoon were to set requirements, consider what could be better in comparison with old spray pontoons, design the pontoon and select the right parts.

The HAM 310 is a 168m long trailing suction hopper dredger which was built in the Netherlands more than 30 years ago. Therefore the vessel had to be maintained to satisfy the requirements that have to be met to operate the vessel. During the maintenance of the HAM 310, the main tasks were to track the progress, regulate the logistics, check the invoices and supervise the repairs of subcontractors.

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Introduction

During my internship at Van Oord I contributed to two different projects, both located in Singapore. The first month I worked on a project at the branch office in Singapore. The objective of this project was to design and supply a spray pontoon. The last two months I was a member of the project team responsible for the maintenance of the trailing suction hopper dredger HAM 310. This report will provide a general introduction to Van Oord, describe the spray pontoon project and my experiences on the project team for the repair of the HAM 310.

Van Oord

Van Oord is a family-owned business that operates around the world as a leading contractor for dredging, marine engineering and offshore projects. The offshore activities can be divided between offshore oil & gas and offshore wind. Van Oord operates in more than fifty countries. It started as a small company and grew over time by acquiring leading dredging and marine engineering firms.

Dredging

Dredging is one of the company's core activities. Dredging is an excavation activity carried out underwater with the purpose of gathering bottom sediments and disposing them at another location. This can be used for among others port and waterways and land reclamation.

Ports and waterways

The volume of trade is growing which results in bigger ships and therefore countries have to expand their ports and waterways. Longer quay walls and wider deeper access channels are crucial. Sometimes even a complete new port or canal has to be made.

Land reclamation

Coastal areas are popular and cities and ports are therefore growing. It is not always possible to expand on land. Van Oord makes it possible to expand in the direction of the water. This is made possible by dredging sand at sea and depositing it closer to shore. The land can be used for a variety of purposes as: ports, industrial estates, housing development, holiday accommodation, beaches and/or nature reserves.

Projects

One of the signature projects of Van Oord is the megaproject Palm Jumeirah, Dubai, better known as Palm Island (see figure 1). In this project 700 ha of new land and 11 km long breakwater were created using 110 million m^3 of sand.

Figure 1 Palm Island

A more recent project in which Van Oord took part was the new parallel Suez Canal in Egypt (see figure 2), finished in the summer of 2015. During this project 200 million m^3 has been dredged to create the new canal. The canal is 35 km long 24 m deep and 200 m wide. The effective build schedule was only 10 months which made the construction of the canal a challenge. More than 1800 people from 45 countries worked on the project, including 300 members of Van Oord.

Figure 2 New Suez Canal

Equipment

Van Oord has different kinds of equipment for executing the projects mentioned above. Currently they have the following equipment for dredging purposes:

Trailing suction hopper dredgers	22
Cutter suction dredgers	18
Split hopper barges	10
Water injection dredgers	11
Backhoe dredgers	5
Flexible fallpipe vessels	3

This report will only elaborate on the trailing suction hopper dredger as this is the type of ship I have worked with. Information of the other equipment can be found on the website of Van Oord.

Trailing suction hopper dredger

A trailing suction hopper dredger has large powerful pumps and engines that enables it to suck up sediments. These pumps are connected to one or two suction pipes that are attached to the vessel and can be lowered to the sea bottom. At the end of the suction pipe a draghead (see figure 3) is attached which is used to regulate the mixture of sand and water that is sucked up. The mixture of sand and water is stored in the hopper and most of the water is discharged.

Figure 3 Draghead

There are several methods to empty the hopper. The first method is to open the doors in the bottom of the vessel so that the dredged material falls out the hopper.

The second method is to use jet pumps to pump water into the hopper at high pressure so that the sediment becomes 'fluid' again. The dredge pumps can then pump the mixture through a pipeline which lead to the land reclamation area or to a spray pontoon.

The last method is somewhat similar to the second method. However, the mixture is not pumped through a pipeline but instead it is sprayed over the vessel’s bow directly at the desired location. This will give a brown arc in the sky which looks a bit like a rainbow. Therefore this method is called rainbowing, see figure 4.

Figure 4 Trailing suction hopper dredger during rainbowing

Organization

Van Oord is a company with several departments. I did my internship at the Ship Management Department (SMD). The Ship Management Department is divided in sub-departments such as: Plant Department, Fleet Personnel Department and Plant Design & Construction. The sub-departments I worked for were the Plant Design & Construction and the Plant Department. The first is responsible for new building projects and the latter is responsible for all the current equipment.

Spray pontoon

Introduction

The objective of this assignment was to design and construct a spray pontoon (see figure 5) for a project in Taiwan. A spray pontoon is used to discharge dredged material at a particular location in a controlled way. The main parts of a spray pontoon are winches, pipes and a spray head. The winches are used to position the pontoon. The pontoon is connected to a hopper with a floating pipeline to transport the dredged material to the spray head. The spray head regulates the flow of the material and reduces the speed.

The project in Taiwan has a working area of approximately 1000 m * 700 m within a U-shaped ring of concrete caissons. The height of the caissons is +4.7 m. The sand on location is fine with a large silt content. The original depth is about -15 m and must be built up to the height of the caissons.

The reason that a spray pontoon is chosen over normal discharge, for example rainbowing, is because the location of the discharge of sand is more precise and controlled and therefore the silt content can be kept equally spread over the working area. With a spray pontoon it is possible to build up layers over the whole area and therefore the sand will also settle equal in time. This is good for the quality of the reclaimed land and reduces the change of collapsing.

Figure 5 Spray Pontoon

Problem definition

The spray activities were expected to start by the beginning of March, which means that the pontoon had to be ready in Batam, the Van Oord yard nearby Singapore, at the beginning of February. This was a very short delivery time, therefore it was only possible to use existing equipment which hopefully would satisfy the requirements. At the beginning of the project the following requirements were compiled.

The pontoon should:

- Discharge 300 m^3 per minute.
- Spray layers with a maximal thickness of 2m.
- Be hoistable.
- Be under class.
- Have a by-pass to be able to rainbow the material.
- Support a Ø 900 pipeline.
- Contain 4 winches including fairleads and anchors.
- Contain welfare facilities for minimal 2 persons.
- Contain a full safety setup.
- Contain fendering including proper measure for safe transfer of personnel.

Orientation

At the beginning of this project I went to another project in Jakarta to see a spray pontoon at work. I talked with the crewmembers on board about their experience with the spray pontoon and if they would change something if they could. I also talked with the technical superintended of the spray pontoon about the problems that had occurred. These experiences and tips were really helpful for the design of the new spray pontoon. The most important recommendations were:

- Make sure the distance between the winches and fairleads is large enough.
- Make sure the parts are of decent quality. It cost a lot of time and money to replace parts so invest in a good product.
- Make sure there are spare parts available immediately when the quality of a product is not good.

Pontoon

It was very important that the pontoon was available as soon as possible. Because of the limited time the pontoon had to be located in the nearby area. All surveys had to be up to date so that the pontoon would satisfy all requirements according to class. This is necessary to comply with all the legislations. An example of such a survey is a Bottom Survey in Dry Dock. With this survey the bottom of the ship/pontoon is inspected and the thickness is measured at several locations.

First of all the possibility to use an existing spray pontoon was investigated. This was not the case, as one spray pontoon did not function properly and the others were used at other projects around the world. Therefore a new spray pontoon had to be fabricated.

For the pontoon three different solutions were found and compared. The first solution was a pontoon called Guavina, located in Batam, Indonesia owned by van Oord. The second solution was to buy a modular pontoon in the Netherlands. The third option was to look for a pontoon in Taiwan.

Guavina

Advantage	Disadvantage
Already owned	Has to be transported to Taiwan, which cost a lot of time and money
Already in our yard, so modifications can start immediately	Is a bit small
Technical drawings and classifications available	
There is a lot of experience with nearby suppliers	

Modular pontoon

Advantage	Disadvantage
Easy transportation, so easier to use at another project	Has to be transported to Asia
Easier to lift over the caissons	Expensive
	Not a lot of experience with modular pontoons

Local pontoon

Advantage	Disadvantage
No transport to Taiwan	Have to find a suitable pontoon
	No experience with local yard
	No Technical drawings and classifications available (yet)
	No experience with local suppliers

After comparing the pros and cons of the possible solutions it was decided to use the Guavina as plan A, because with the Guavina it was possible to immediately start the engineering of for example the deck foundations. However the project team in Taiwan was assigned to look for a suitable pontoon locally as a plan B. After a week the local project team found a pontoon that was suitable for doing the job and the decision was made to use that pontoon instead and fabricate everything in Taiwan. The main arguments for this decision were the time saved by avoiding the transportation of the completed pontoon as well as the rough sea conditions that the pontoon had to endure during transport.

Spray head

There a different types of spray heads: a chute, a cooking pot, and a spreader bar. The chute can be seen in figure 5. For this project a combination of a spreader bar and a cooking pot is chosen, this combination is called 'spreader cooking bar'. The spreader bar will be the same length as the width of the pontoon. A half pipe is attached below to reduce the speed in the flow, see figure 6.

Figure 6 Spreader cooking bar

Winches

The winches are used to position the pontoon in a certain area within the anchors. To be able to position the pontoon in a square a minimum of 3 winches is needed. In the past the winches were the cause of a lot of downtime. The reason for this is that normal winches are not designed for the amount of hauling that is required to operate a spray pontoon. This has to be taken into account during the selection of possible winches. Another solution to reduce the downtime is to have 4 functional winches on the pontoon. In this case with a failure the pontoon is still able to operate. The following requirements have to be taken into account:

Required Winch speed

The pontoon needs to discharge 300 m^3 per minute. The spreader bar is 12.5 m long so the spray area is 25 m^2/m. The required maximal thickness is 2 m, therefore a sway velocity of at least 12.5 m is required. So a winch speed of 12.5 – 15 m/min is sufficient.

Required pulling force

The required pulling force should be minimal 30 ton, this is based on experience of earlier projects. The winch should be able to deliver constant tension for proper control and positioning.

Wire capacity

The project requires at least 500 m wire to make large enough strokes.

For the winches several companies were asked to make a quotation based on the requirements. In addition to the technical requirements there were also logistic and time requirements which where even more important because of the limited time that was available. Because of this companies could only make a quotation of the winches they had in stock. For the comparison see appendix A.

Decision

It is chosen to use the HydrauWinch 50 CT (see figure 7) from the Dutch company Hydrauvision. This winch satisfies all the requirements (Technical specifications see appendix B). The winch can be remotely operated with the operator's panel (see figure 9). The winch is provided with wire length measurement and constant tensioning (CT). The winch has a free fall function which is useful for placing the anchors with a multicat. Free fall means the wire can roll out with minimal resistance, just enough to keep the wire tensioned. The 4 winches are paired with 2 Hydraulic Power Units (HPUs) (see figure 8) from the same company. The HPUs are needed to power the winches. The HPUs are diesel-driven with a maximum engine power output of 200kW. The benefit of a diesel-driven HPU is that it saves space because an electric generator is not needed.

Figure 7 Winch

Figure 8 Hydraulic Power Unit

Figure 9 Operator's panel

Fairleads

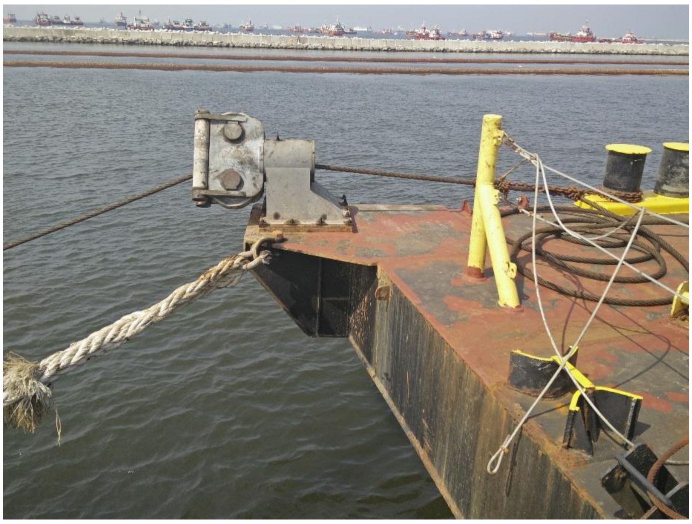


Figure 10 Fairlead

Fairleads (figure 10) are used to guide the wires on the deck from the winch to the location where the wire leaves the pontoon. Because the pontoon is positioned with the wires a lot of hauling takes place. Therefore the fairleads should be wear resistant and have the correct size. In a previous project the fairleads wore a lot, which resulted in a lot of downtime. The fairleads are bought at a local supplier in Singapore. The alignment and distance of the winches and the fairleads are very important to reduce wear.

Layout

The layout of the pontoon is very important, especially the distance between the winches and the fairleads. The maximum theoretical allowed flee angle is 1.5 degrees otherwise a spooling device is needed which is not desirable. The length of the drum is 1050 mm this results in a distance of 20 meters, see figure 11.

$$Distance = \frac{half\ of\ drum\ length}{\tan(flee\ angle)}$$

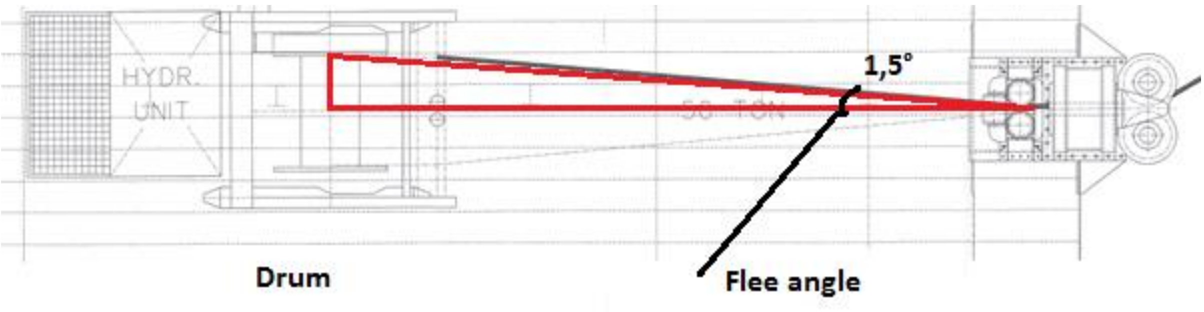
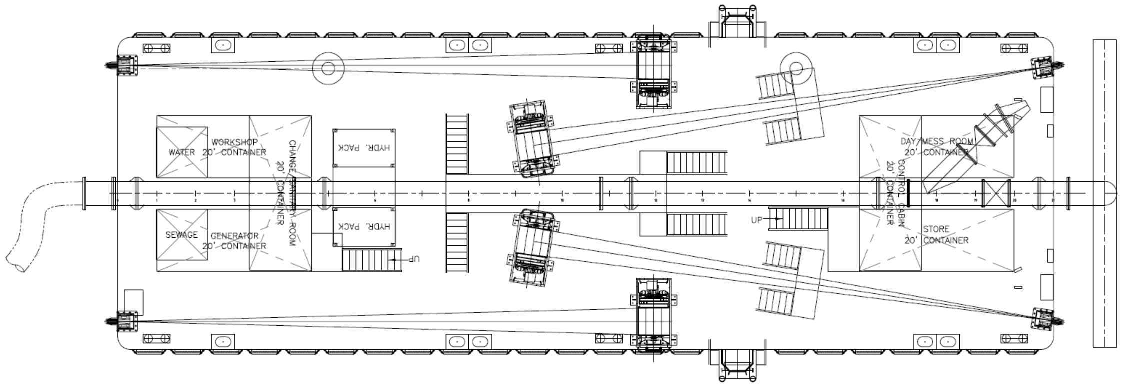
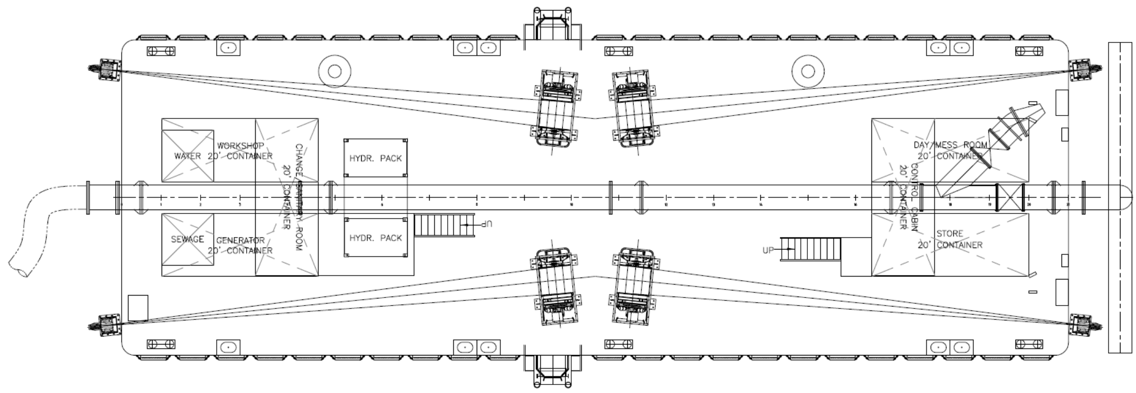


Figure 11 Situation winch and fairlead

Unfortunately this distance is not possible in a conventional back to back setting, see figure 12 (Deck arrangement 2). The distance is possible in deck arrangement 1. However, it takes much more space, more stairs are needed and it is inconvenient to use. Therefore the decision was made to consult the supplier regards the shorter distance. The experience of the supplier is that a shorter distance is possible. Therefore the back to back setup is chosen. The facilities, Hydraulic Power Units, pipeline and boat landings can also be seen in the deck arrangement.



Deck arrangement 1



Deck arrangement 2

Figure 12 Deck arrangements

By-pass and Rainbow nozzle

One of the requirements was that the pontoon should have a by-pass to be able to rainbow the material. In figure 13 it is possible to see a T-pipe with a closing valve on each end. With these valves it is possible to regulate the mixture to the rainbow nozzle or to the spray head. Figure 14 gives a better view of a closing valve.

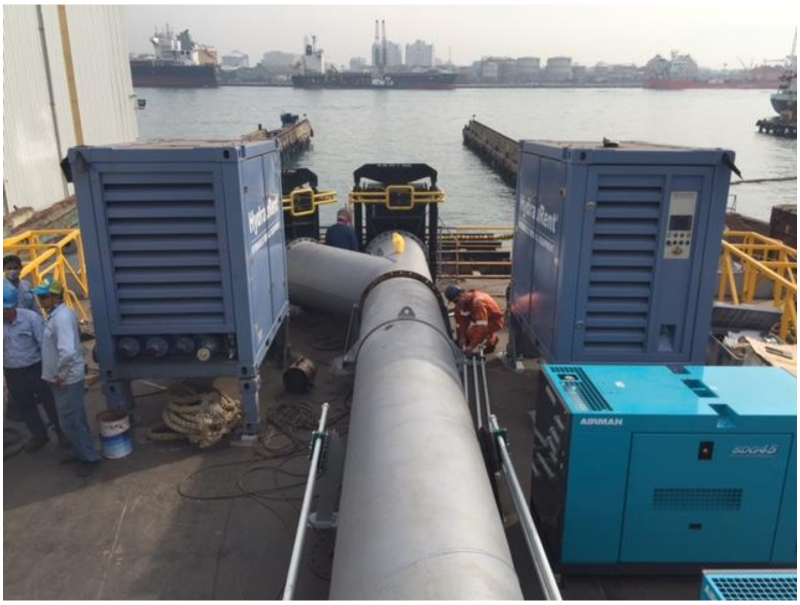


Figure 13 T –pipe on the pontoon

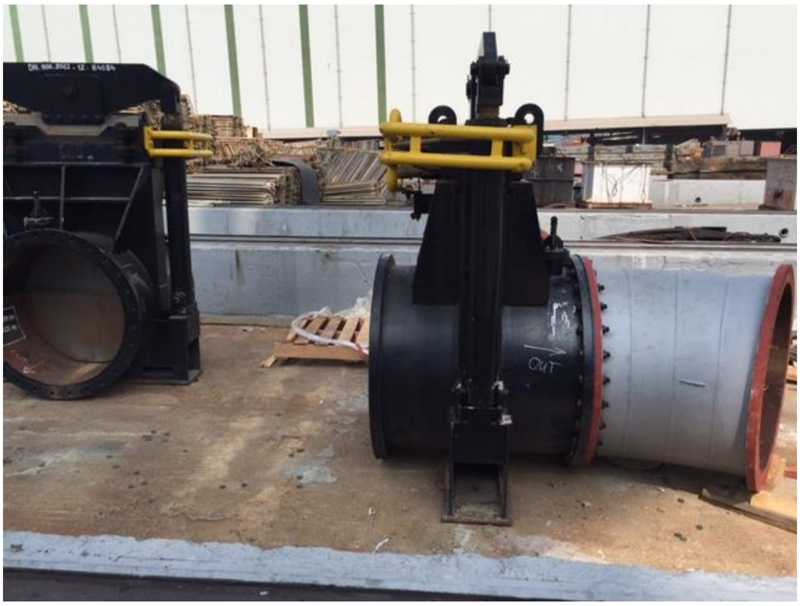


Figure 14 Closing valve

Facilities

There are different facilities necessary to operate a spray pontoon. First, a mess room for the crew (+- 3 persons) should be aboard. Secondly a wet room (toilet facilities) should be present. Thirdly a workshop and storage place is needed to be able to do minor repairs and to perform maintenance. Fourth a control room should be placed on a higher level to have an overview of all activities on deck and to control all processes, such as operating the winches.

The mess, wet and operate room have been accommodated in two 20ft containers which will be rented from ELA[container] (a German company that is specialized in mobile rooms for all industries). The setup can be seen in figure 15. The container below will function as a wet room and contains a toilet, a shower and a washing machine. The container on top will function as mess- and control room.

The workshop and storage place have been accommodated in a standard 20ft container which is purchased and furnished locally.

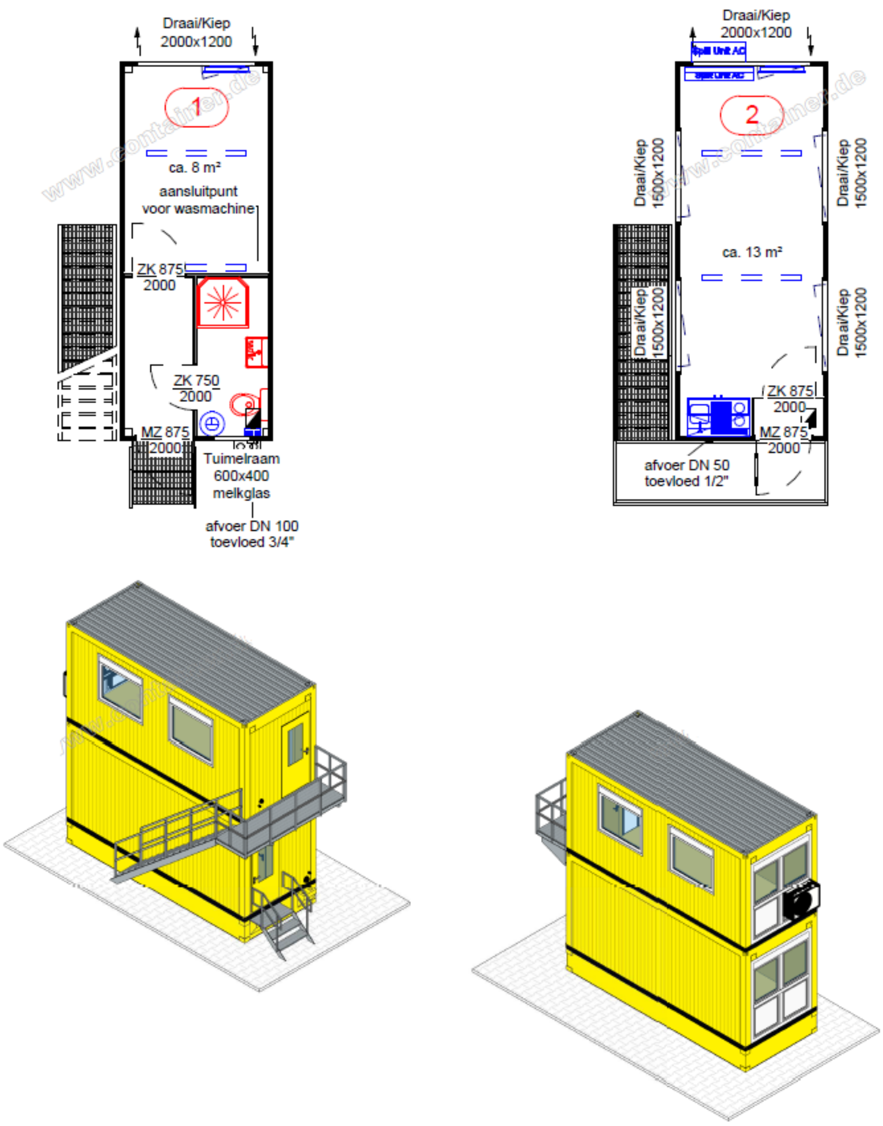


Figure 15 ELA containers

Conclusion

The final result can be seen in figure 16. This figure shows the pontoon while being tested. The pontoon lies between the caissons and is connected to the floating piping line which is connected to a Trailing suction hopper dredger. The pontoon was tested under normal working conditions and the winches were tested on maximal strength, speed and constant tensioning. These tests were satisfactory and the pontoon was put into operation.

Figure 16 Final result

Maintenance HAM 310

Introduction

The HAM 310, see figure 17 is a 168m long trailing suction hopper dredger which was built in the Netherlands more than 30 years ago. In 2000, the vessel was lengthened and in 2010 the vessel was re-motorized. The main objectives of the maintenance were to satisfy the dry dock items of the 30 years Class Renewal Survey (authorized by Bureau Veritas), the overhaul of the main engines and auxiliary engine and renewal of the accommodation. The repairs were divided between the shipyard and subcontractors.

Figure 17 HAM 310

The major repair items for the shipyard are:

- Steel repair works of hull construction. Approximate 150 ton of steel renewal.
- Complete conservation of hull with silicon fouling release paint.
- Renewal of all pins and bushes of bottom door installation (22 doors).

The major repair items for subcontractors are:

- Overhaul of two main engines and an auxiliary engine
- Renewal of accommodation

Schedule

The vessel arrived in the yard on the 11^{th} of December 2015.

The vessel went in the drydock on the 18^{th} of December until the 12^{th} of January 2016.

The sea trails started the 1^{st} of February 2016.

Responsibilities

During this project I was a member of the project team. My responsibilities were amongst others logistics, budgetary, piping jobs, staging and making a log.

Every day started with meetings. The first meeting was with the project team and the Captain, Safety Officer, Dredge Master and Chief Engineer of the vessel. In these meetings the progress and the activities that were planned for the present day were discussed.

The second meeting was with the employees of the yard. This meeting was led by the Ship Repair Manager (SRM) and the Safety Officer of the yard. All supervisors of the different trades, such as mechanical, piping or painting, had to be present to discuss safety. During this meeting unsafe situations that had occurred and unsafe conditions in the shipyard were discussed. After this the high risk works to be carried out in the next 24 hours were identified and noted. A few examples of these high risk works are:

- Ballast/deballast
- Bunkering/transferring of oil
- Roller/brush/spray painting
- Grit blasting
- Hydro jetting
- Removing/closing manhole cover
- Pressure testing
- Heavy lifting

Logistics

This project involved a lot of logistics, mainly due to the transportation of parts needed for maintenance. The transportation of parts started before the vessel arrived and went on till the end of the project. The parts that where necessary were stored in several locations including the Netherlands, Singapore and Indonesia. All these parts had to be transported to the yard. When the vessel arrived a lot of parts had to be taken off. This was not always easy, because most parts were too heavy to lift without a crane and the availability of cranes was not that high. Therefore a good planning was very important. Some parts had to be rigged to a certain position before the crane was able to lift it out, see figure 18.

Figure 18 Rigging of the Jetpump E-motor

A lot of these parts had to be overhauled, some parts were overhauled in the workshop of the yard, some parts had to go to subcontractors in Singapore and some parts were sent back to the Netherlands. Examples of these parts are:

- Breakers
- Trunnion winch motors
- Intermediate winch motors
- Dredge pump E-motors
- Coolers
- Engine parts
- Turbocharger
- Hydraulic cylinders
- Bearings
- Couplings
- Bow thrusters
- Dragheads

During these overhauls I had to visit the subcontractors several times to monitor the progress and verify that everything was in order. This was not always the case. The bow thrusters, of which one did not work, were send to Wärtsilä Singapore. When I arrived there to see the progress it turned out that the damage was much more severe than expected, see figure 19. This bow thruster was too damaged for overhauling and therefore a new bow thruster had to be found. This was quite a challenge because of the age of the bow thruster. Eventually a bow thruster was found in the Netherlands which could serve as a replacement.

Other parts had to be taken of so that the vessel would be lighter for in the dry dock and/or to make space for reparation jobs. All these parts were stored at the yard.

Figure 19 Damaged Bow thruster

Dry dock

The vessel went to the dry dock a week after it had arrived in the yard. The first step was to position the dock blocks so that the vessel would lay stable and the hopper doors could still be opened. The next step was to fill the floating dock with water so the deck of the dock would submerge so that the vessel can enter. The Vessel was guided to the entrance of the dry dock by tug boats with powerful engines. When the Vessel was laying in front of the entrance, mooring lines were thrown to the persons on the dry dock. The lines were connected to a hook on both sides of the dry dock. The ship entered the dry dock because the hooks were on a rail and could move to the end of the dry dock. When the vessel was positioned and moored, divers checked if it was positioned correctly on the dock blocks. The last step was to pump the water out of the dry dock so it would float again. In the figures below the process can be seen.

Figure 20 Dry docking 1

Figure 21 Dry docking 2

Figure 22 Dry docking 3

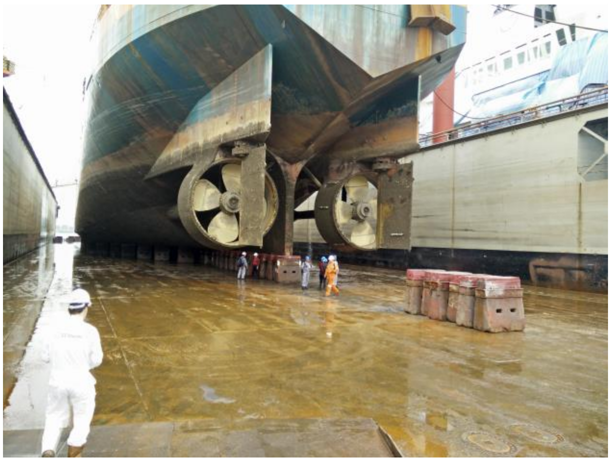


Figure 23 Dry docking 4

Budgetary control

Another responsibility I had was budgetary control. For example the yard invoiced the cost they made for replacing steel and I had to control if these costs were according to the contract. These costs depended on the quality of the steel, the location and the amount replaced per location.

The process is as follows: When the steel is replaced the yard supervisor fills in a work list attachment with among others the job description, the corresponding job number and the amount of steel replaced. The steel plates are noted as l*b*h.

During these controls I found a few mistakes of the yard which resulted in saving quite a lot of money. One of these mistakes was due to misunderstanding of the handwritten work list attachment. Supervisors were not always consequent in the notation of the steel plates, sometimes they wrote the dimensions (l*b*h) in front of the size and sometimes they did not. Because of this the commercial executive of the yard mistook the letter b for the number 6 which resulted in an invoiced order of 10 times more replaced steel than what actually was replaced.

Staging

In this project a lot of staging was used as for a lot of repair items staging was necessary to complete the job. Van Oord had to pay for every m^3 of staging. My responsibility was to check all the staging, with the staging supervisor of the yard, and make sure that all the staging invoiced was present and correct.

Load test

Some parts had to be load tested before they could be certified again. This was necessary for the Class Renewal of Bureau Veritas. An example of such a load test can be seen in the figures below. This load test is to test the strength of the lifeboats and the lifeboat shackles. The first test was to fill the lifeboat with a heavy load and lift it out of the water for several minutes. The second test was to pull the shackles with a high force (20 kN).

Figure 24

Figure 25

Figuur 26

Figure 27

Learning points

My time at Van Oord has taught me the practical side of what it means to be a mechanical engineer. Instead of doing research, I was in the field very often. I really enjoyed doing this, especially keeping overview during the HAM 310 project. I did not experience the responsibility I had during this project as a burden, instead I liked this experience of 'leading' a project. It has taught me that this is a direction I will seriously consider in my later career.

Another skill that I have learned during my internship at Van Oord is to be very flexible. The starting date of my internship changed several times because the docking was postponed several times. A week before my internship would start in November, the docking was postponed till January. Fortunately there was another assignment, the spray pontoon, that I could do instead. During this assignment the docking date was brought forward so I could also join the project team of the docking.

A point of improvement that my supervisor brought to my attention is that sometimes I should be more resolute when something needs to get done. When I ask someone to do something, I should not take for granted that they will actually do it (in time) and keep on reminding and sometimes pushing them to do it.

Another point that I learned is that time is really important and often limited. Therefore it is not always possible to do things in an optimal way. For the spray pontoon we had to use parts that were immediately available due to time pressure even if these were not the optimal choice. Thus, I have learned that it is always important to weigh out quality against time and choose for the most suitable option.

During the docking of a vessel you get to see everything of the vessel, from the hull to the accommodation, from the rudder to the dredge pumps. During the docking I got a complete understanding of how the vessel works and what the purpose is of every part. It is a really nice experience to walk under the vessel, to be in the engine room or to crawl in a dredge pipe. I also saw the engines, turbochargers and gearboxes disassembled which gave a broader understanding of how everything works.

At Van Oord I had to work autonomously because my supervisor was not always available which has taught me the skill of self-reliance. At the beginning of my internship this was quite challenging sometimes because I had to deal with many things I was not familiar with. Yet as my internship progressed I noticed that it was not an issue anymore and in general I am quite satisfied with how it went throughout my entire internship.

SGD to Euro: 1.5		**Promotor** (purchase)	**Hydrauvision** (purchase)	**Hydrauvision** (All rental , 70 weeks)	**Hydrauvision** (Winch Purchase, HPU rental 70 wks)	**Ridderinkhof** (purchase)
WINCH - A	Type	PM-HSD-35, hydraulic	50 CT, hydraulic	50 CT, hydraulic	50 CT, hydraulic	R-TUW-H-250, hydraulic
	Winch Pull	35T	30T	30T	50T	25T
	Winch Speed	9m/min - 35T 18m/min - 16T	9m/min - 200l/min	9m/min - 200l/min	9m/min - 200l/min	20m/min - 10T 35m/min - 6.5T
	Brake Type	Hydraulic, spring return band	Hydraulic, band	Hydraulic, band	Hydraulic, band	Hydraulic, slipping brake
	Brake Holding	90T	60T	60T	60T	30T
	Clutch Type	Jaw	-	-	-	-
	Spooling Device	Yes	no	no	no	no
	Drum capacity	1000mx38mm	500mx36mm	500mx36mm	500mx36mm	550mx30mm
	Drum diam	600	610	610	610	508
	Hydraulic Supply	87.5 kW	200l/min 280bar	200l/min 280bar	200l/min 280bar	137 l/min
	Hoses included	No	Yes	Yes	Yes	No
	Foundation/skid included	No	Yes	Yes	Yes	Yes
	Installation included	No	No	No	No	No
	Remote Control included	No	Yes	Yes	Yes	yes
	Inclusive wire (spooled)	No	Yes	Yes	Yes	No
	Dimensions:					
	L	2500	2690	2690	2690	1400
	W	3070	1810	1810	1810	2085
	H	1975	1660	1660	1660	1310
	Weight (ex wire)	-	6400 kg	6400 kg	6400 kg	1810 kg
	No of units	6 4	4	4	4	4
	Price (SGD)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Delivery time EXW	3-4 weeks	1 week	1 week	1 week	1-2 weeks
	Transport	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Total - A	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
HPU - B	Type	GA 90				-
	Diesel/Electric driven	Electric	Diesel	Diesel	Diesel	Diesel
	CT	Yes	Yes	Yes	Yes	Yes
	Max working pressure	-	350 bar	350 bar	350 bar	-
	Max Output Flow	200 l/min	450 l/min	450 l/min	450 l/min	-
	Engine power	90 kW	224 kW	224 kW	224 kW	-
	Hydraulic pwer	-	170 kW	170 kW	170 kW	-
	Hydraulic Power, effective	210 Bar	210 bar	210 bar	210 bar	-
	Dimensions:					-
	L	1600	2440	2440	2440	-
	W	1900	1510	1510	1510	-
	H	2000	2210	2210	2210	-
	Weight (empty/full)	2200/3880	4800/5825	4800/5825	4800/5825	-
	Tank capacity, fuel	-	450 l	450 l	450 l	-
	Tank Capacity, hydraulic	2000 l	700 l	700 l	700 l	-
	No of units	4	2	2	2	2
	Price (SGD)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Delivery time EXW		1 week	1 week	1 week	
	Transport	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Total - B	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
GEN SET - C	Electric Power Pack required	yes	No	No	No	No
	Power	650 - 850 kVA	-	-	-	-
			-	-	-	-
	Dimensions:	20ft	-	-	-	-
	L		-	-	-	-
	W		-	-	-	-
	H		-	-	-	-
	Weight (ex wire)		-	-	-	-
			-	-	-	-
	No of units	1	-	-	-	-
	Price (SGD)	[redacted]	-	-	-	-
	Transport	[redacted]	-	-	-	-
	Total - C	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Total (A+B+C)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Remarks:	3-4 weeks delivery time in SG Winch of doubtfull quality HPU of doubtfull quality 850 KVA gen set required	1 week delivery in NL 2 stand alone HPU; no additional gen set Incl remote, foundation/skid, hoses and pre-spooled wire Tech support available	1 week delivery in NL 2 stand alone HPU; no additional gen set Incl remote, foundation/skid, hoses and pre-spooled wire Tech support available	1 week delivery in NL 2 stand alone HPU; no additional gen set Incl remote, foundation/skid, hoses and pre-spooled wire Tech support available	1 week delivery in NL 2 stand alone HPU; no additional gen set Incl remote and foundation/skid Tech support available

Additional info required
Good
Marginal
Bad

Hydrauvision

HydrauWinch 50 CT

50 mton winch, fitted in a hoisting frame.
The HydrauWinch 50 CT can be both locally and remotely operated.

- Local operation: - manual operated pay in/out
- Remote operation: - joystick for winch control
  - constant tension control
  - load indication
  - wire length indication
  - double speed
  - free fall

For remote operation the HydrauWinch 50 CT can be provided with a portable operators panel.
The HydrauWinch 50 CT is provided wire length measurement.
The wire length is displayed on the operators panel. Wire length zeroing function is provided.
Control functions for CT operation are integrated in the operators panel, Bump less shifting between CT and normal operation is provided.
A fail safe band brake ensures safe operation.

Recommended CT maximum is approx. 50% of the maximum line pull.

Technical Specification

Max. linepull $1^{st.}$ layer	: 50 mton
Max. brake holding capacity	: 60 mton ($1^{st.}$ layer)
Max. speed $1^{st.}$ layer	: 9 m/min. @ 200 l/min. *)
Hydraulic supply	: 200 l/min. / 280 bar *)
Max. wire diameter	: 44 mm (not included) **)
Wire capacity (44 mm)	: 300 m (in 5 layers)
Drum diameter	: 610 mm (ungrooved)
Drum length	: 1050 mm
Overall length	: 2690 mm
Overall width	: 1810 mm
Overall height	: 1660 mm
Total weight excl. wire	: 6400 kg
Fluid connections	
Pressure (P)	: SAE 1 ½”-6000#
Return oil (T)	: SAE 1 ½”-6000#
Drain (D)	: 28L
Power supply nominal	: 230 VAC 50Hz – 6A
Power receptacle	: 16 A, IEC 60309
Detailed specifications	: on request

*) Maximum speed depends on hydraulic oil supply.
**) Other diameters on request.

Benefits

- Very compact design with high performance.
- Simple, reliable operation
- Built-on valves provided, no extra components are needed.

- Provided for Constant Tensioning operation, CT performance and accuracy on request

Scope of Supply

Included:
- User manual.
- Remote control, only when CT option is required.

Excluded:
- Wire.
- Hydraulic hoses.
- Transport and installation.
- Hydraulic Power Unit.
- Remote control

All above mentioned items can be included on request.

Hydrauvision

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HydrauRent
HYDRAULIC RENTAL EQUIPMENT

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