

MASTER THESIS

Hydrostatic test on tanks during the section stage of a ship: The case study of the PSV 5000

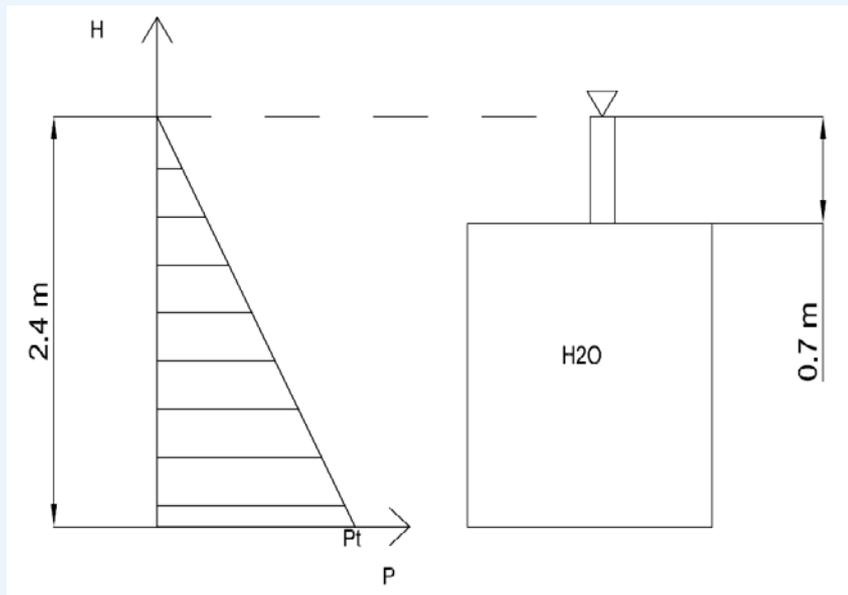
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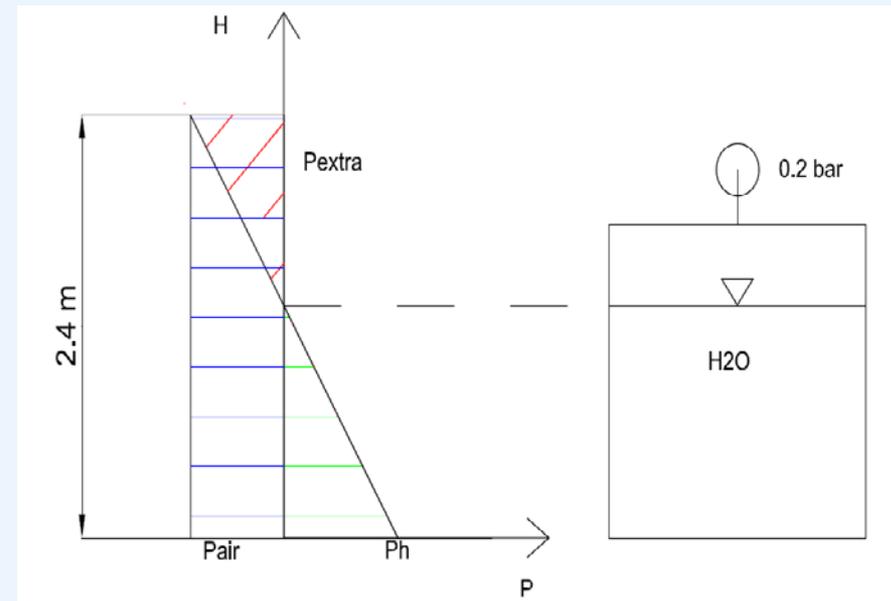
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Hydrostatic Test

The international regulations edit by IACS (S14, Req. 1996) defines the Hydrostatic Test as a structural test carried out to demonstrate the structural adequacy of the design. Where practical limitations prevail and hydrostatic testing is not feasible, hydro-pneumatic testing may be carried out instead.

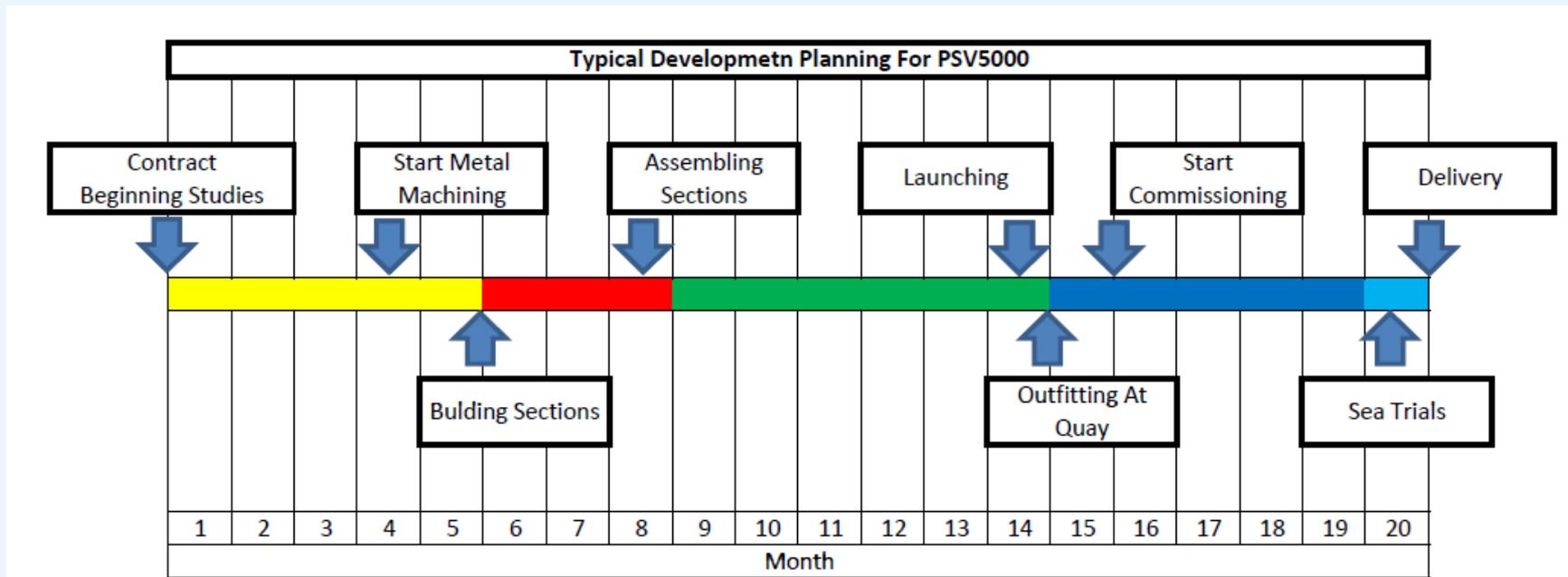


Sketch Hydrostatic Test.



Sketch Hydro-pneumatic Test.

Current Testing Plan In DAMEN



Actual Testing Dates
Start March/21/2016
End April/17/2016

Final Delivery Of The Vessel
May/31/2016

Current Testing Plan In DAMEN

Drawbacks

- ❖ Concerns in case of test failure
- ❖ Difficulty in scheduling
- ❖ Overlapping of activities
- ❖ Use of the fresh water for testing
- ❖ Restore the painting and coating
- ❖ Presence of oil and fuel in tanks
- ❖ Less flexibility in case of new rules



H. T. In A Earlier Stage

The main task is to find the point of construction stage where technically it is possible to carry out the h. t. without disturb and minimizing the interferences with other production aspects.



PSV 5000

H. T. In A Earlier Stage

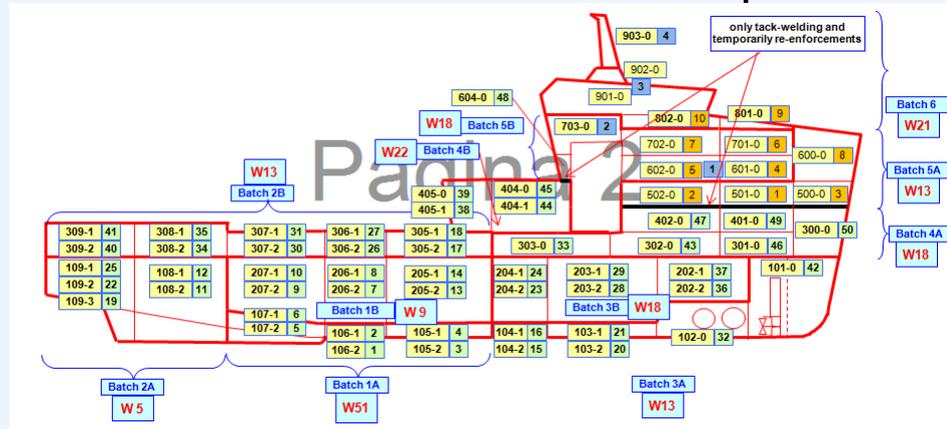
The whole analysis is structured in three main steps:



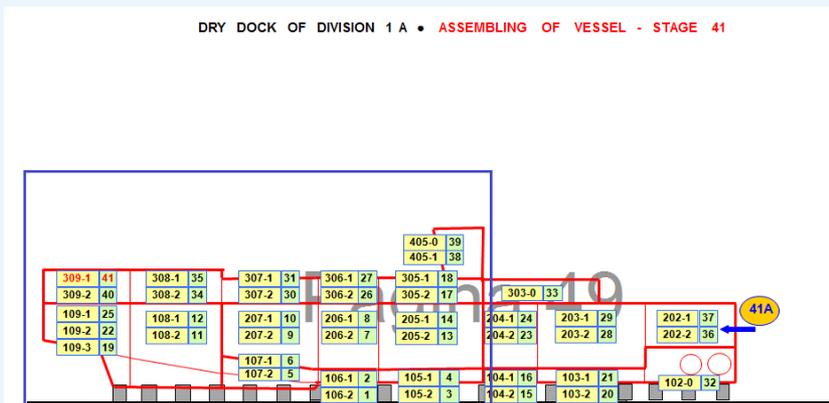
At the end of the process it is necessary to finalize it with the singular peculiarities of each tank and the time, cost analyses.

Building Strategy Analysis

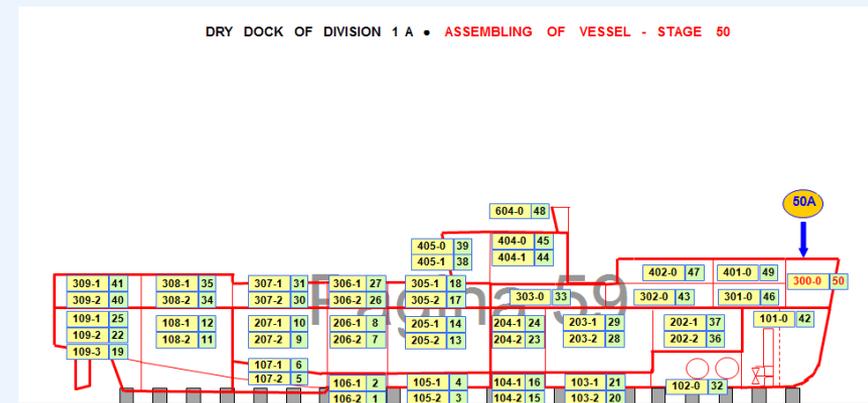
The tanks to be tested are 24.



The tanks are grouped in two groups, abaft the frame 64 and forward to the frame 64.



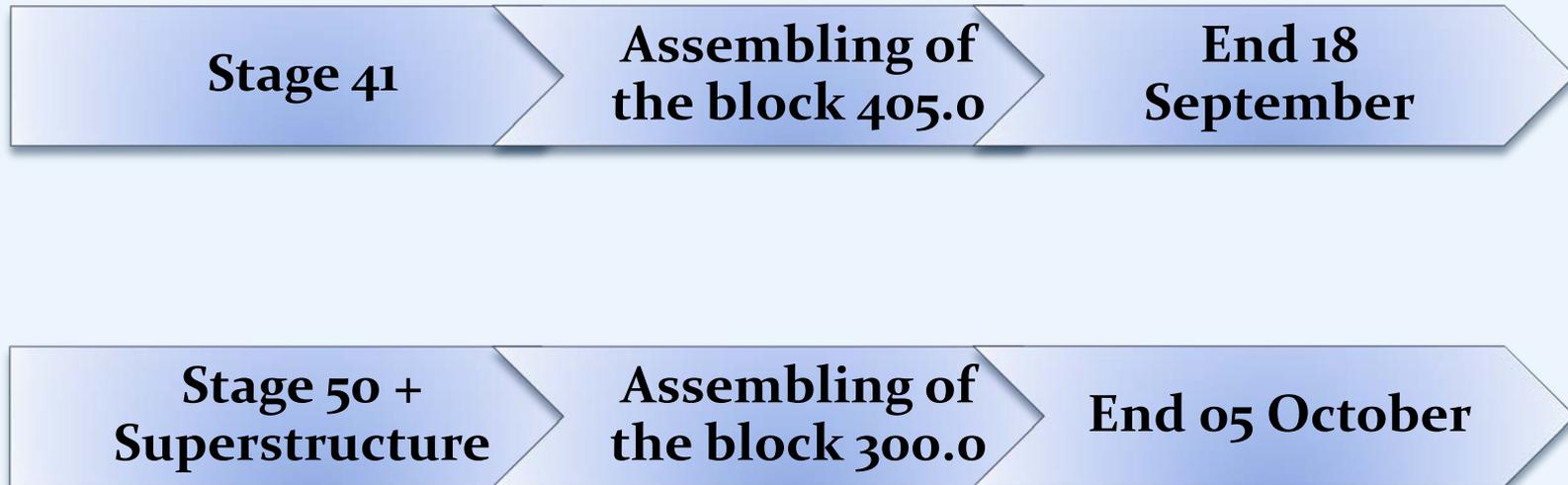
Building stage 41



Building stage 50

Planning Analysis

In the Planning Analysis it is analyzed according the current plan in the shipyard which calendar dates correspond for the stages: 41 and 50.



Considering the dates of start and end of the operations it is created a detailed weight estimation in relation of the above dates.

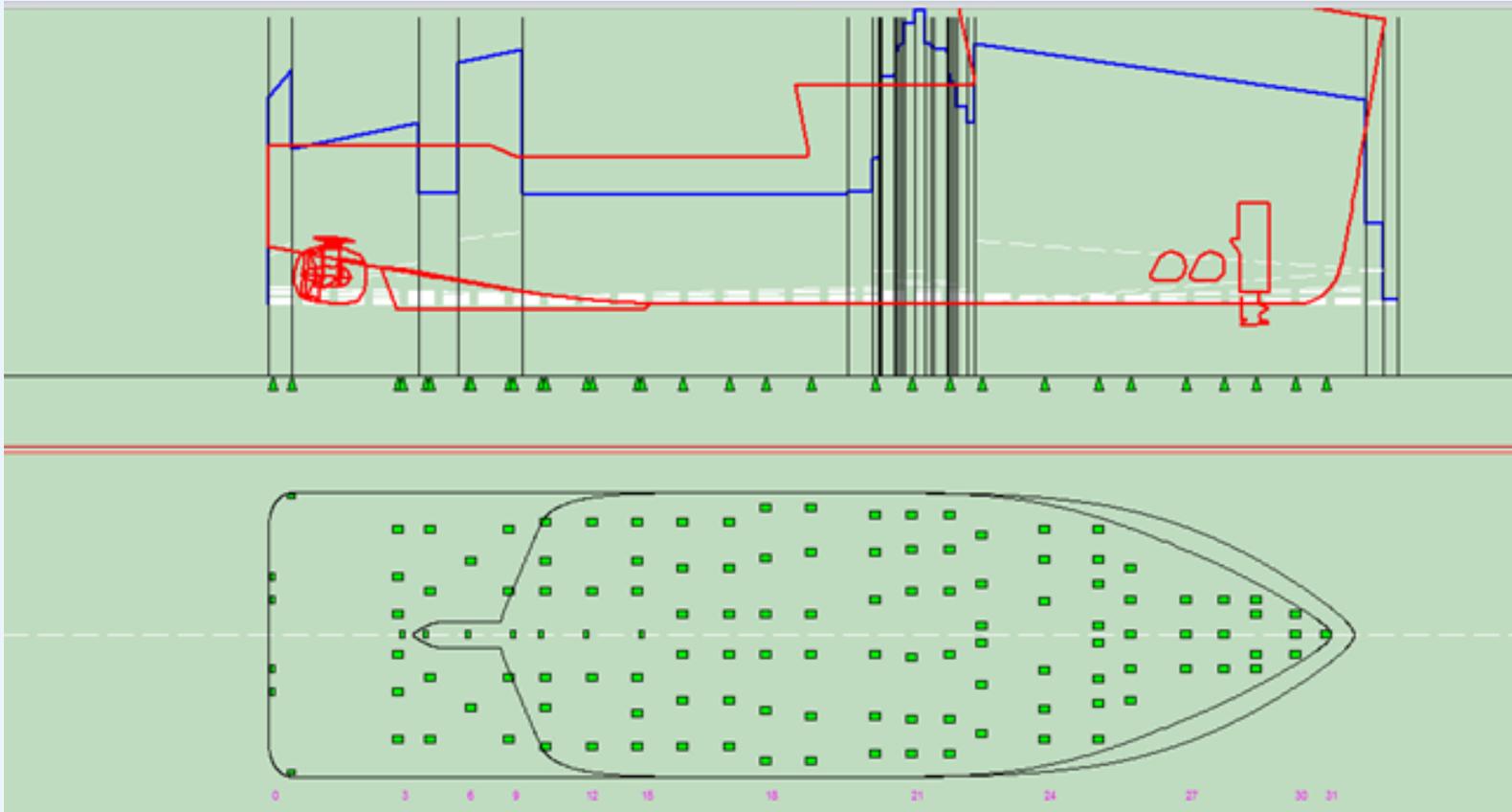
Load Analysis

It is necessary to calculate the loads applied on the blocks when the ship is in the dry dock. They are considered:

- The weight of the block unit.
- The weight of the foundations (if present)
- The weight of piping.
- The weight of the critical equipment.

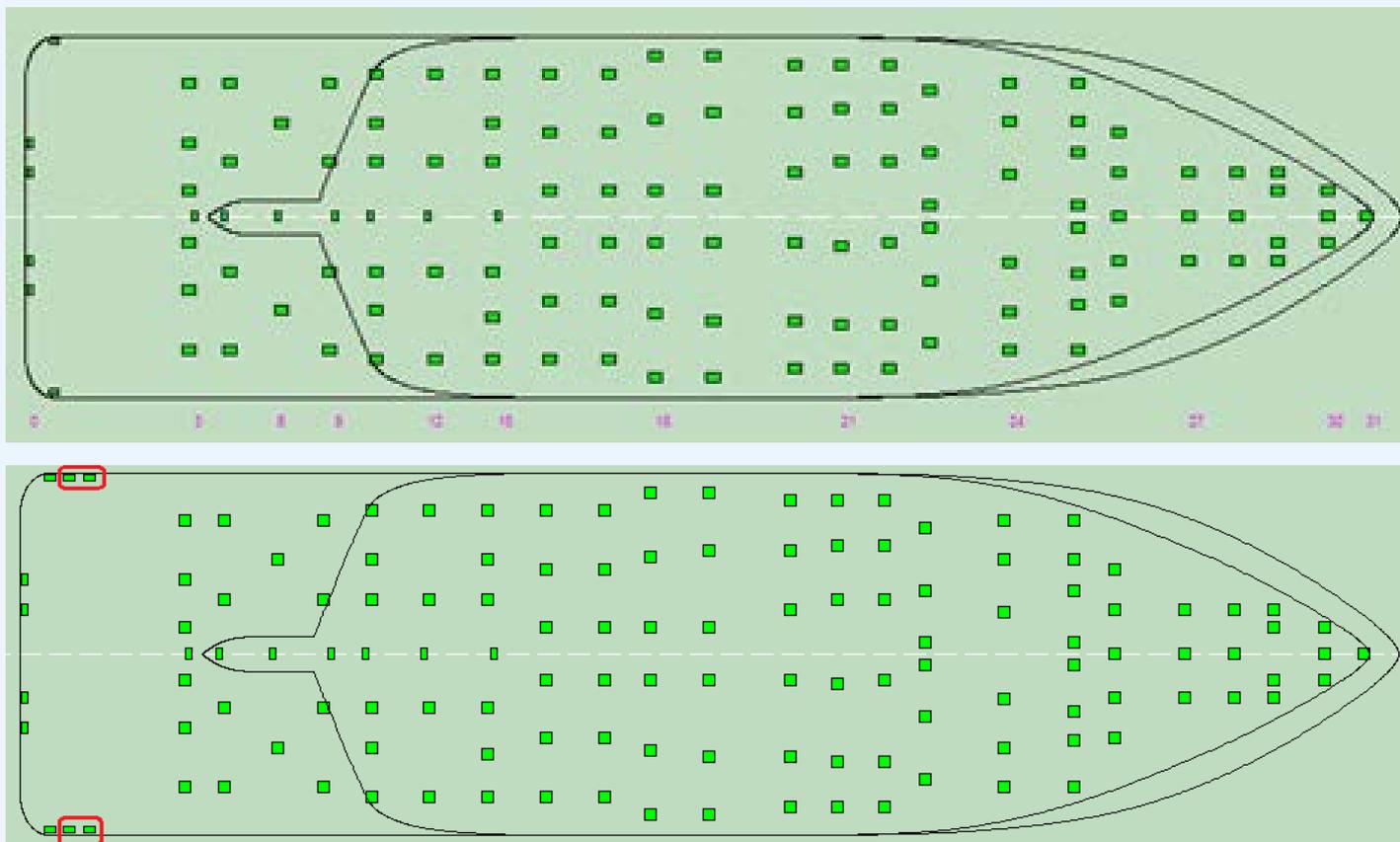
Plus the masses of water contained in the tanks

CVSL_64



On each support the load must not exceed the limit of 50 tons!

Load Analysis



Eight sub-groups of testing with a maximum of four tanks at the same time.

Scheduling

An overall time for testing all the tanks of just above than 800 hours.

Aft part testing:

- Third sub-group end day: 22 September 2015
- Second sub-group end day: 23 September 2015
- Fourth sub-group end day: 25 September 2015
- Fifth sub-group end day: 28 September 2015
- First sub-group end day: 30 September 2015

Total operations
starting day:
18/09/2015
end day:
30/09/2015

Fore part testing:

- Eighth sub-group end day: 12 October 2015
- Seventh sub-group end day: 12 October 2015
- Sixth sub-group end day: 14 October 2015

Total operations
starting day:
06/10/2015
end day:
14/10/2015

The launching is planed for the **November 10 2015**

The test is organized to optimize the resources
and to have constant and uniform work flow.

Cost Analysis

All the operations necessary for perform a structural test on each tank are analyzed and decomposed with the purpose to find the final cost.

Fixed Cost

- **4 more supports**
- **Special tops for tanks**

Variable Cost

- **Preparation piping**
- **Preparation mechanical**
- **Operative cost for the filling pump**
- **Cost for the supervision of the filling operation**
- **Operative cost for the discharge pump**
- **Cost for cleaning**
- **Cost for restoration**
- **Cost for paint damage**

Cost Analysis – Equipments Investments

The main cost item that appears in the sum of final cost is the man-hour. It is economically convenient to introduce devices apt to reduce it..



Inflatable plugs.

Investment cost of **2550 €** - Short time investment.

Cost Analysis - Summary

Actual Cost

Cost Item	€
Variable Cost	6850
Fixed Cost	300
Frsh Water	1200
Final Cost 8350 €	

New Cost

Cost Item	€
Variable Cost	6500
Fixed Cost	300
Final Cost 6800 €	

(Saving obtained for fresh water : 1200 €)

New Cost using New Equipment

Cost Item	€
Variable Cost	6500
Fixed Cost	300
Saving Piping Operations	-1300
Saving Equipments	-150
Saving damage of the paint	-150
Final Cost 5200 €	

Equipments Investments - Additional pumps

More activities in parallel with 4 more pumps, saved 4 working days

- The aft part to **September 28 2015**
- The fore part to **October 12 2015**



Grundfos DW.50.09.3.



Vogel LSB 65-40-200.

Conclusions

The whole study has revealed that it is possible to perform the h. t. in the earlier stage, before the launching. This solution has the advantages:

- Sufficiency of time to make modifications in case of the test failure.
- Favorable workplace
- Easier planning in accordance with others activities, no overlapping!
- Better efficiency organizing the testing groups in sequence.
- Economic savings.
- Possibilities of improvements with the acquisition of new equipment.
- This strategy is suitable also for other types of vessel, especially that ones without systems on boards like Multi Purpose Pontoon.
- Flexibility to new International Rules.

Thank you for the attention.

Questions?