

**Edwin Salas**

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Master Thesis

# Ship Launching in Small Shipyards

**Supervisor: Prof. Tadeusz Graczyk, West Pomeranian University of Technology, Szczecin, Poland**

**Reviewers: Prof. R. Bronsart, University of Rostock, Rostock, Germany**

**: Prof. A. Hage, University of Liège, Liege, Belgium**

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## INTRODUCTION

- The most important process in the shipbuilding industry is a ship launching. The launching process takes various forms in shipyards, especially in proximity of rivers or canals where water level can change any time and where shipping traffic is extensive.
- The launch of a ship is the transference of the ship from the place of construction to water. Typically the ship is launched end on, where the stern gets into water first.
  - **Main idea**
- The principal idea is analyzing all possibilities for making the process of ship launching in one small shipyard and present the possible solutions for development of this process.



# Ship Launching in Small Shipyards

## TRANSVERSAL SHIP LAUNCHING



For shipyards located in narrow rivers (small shipyards), it is common to use the transversal launching or others, where different devices are used for this process. The construction of one longitudinal slipway is reserved for big shipyards where it is possible the construction of big ships.

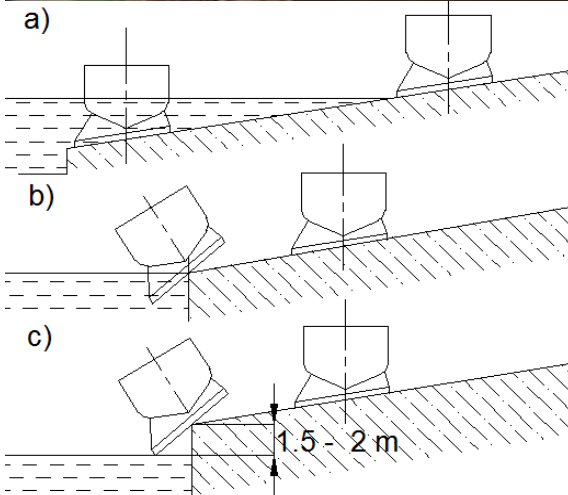


Fig. 15 Types of transversal ship launch  
a - normal launch; b - leap launch; c - throw launch

## CASE OF STUDY-FINOMAR



FINOMAR specializes in production of complex welded structures and provides services for the shipbuilding and power industry.

Position of the company allows for transport of materials and finished products by land or water. The company is situated on Oder river with further access to sea.



## ACTUAL PROCESS OF SHIP LAUNCHING-FINOMAR



The object of my study is a shipyard (FINOMAR) with the following limitations:

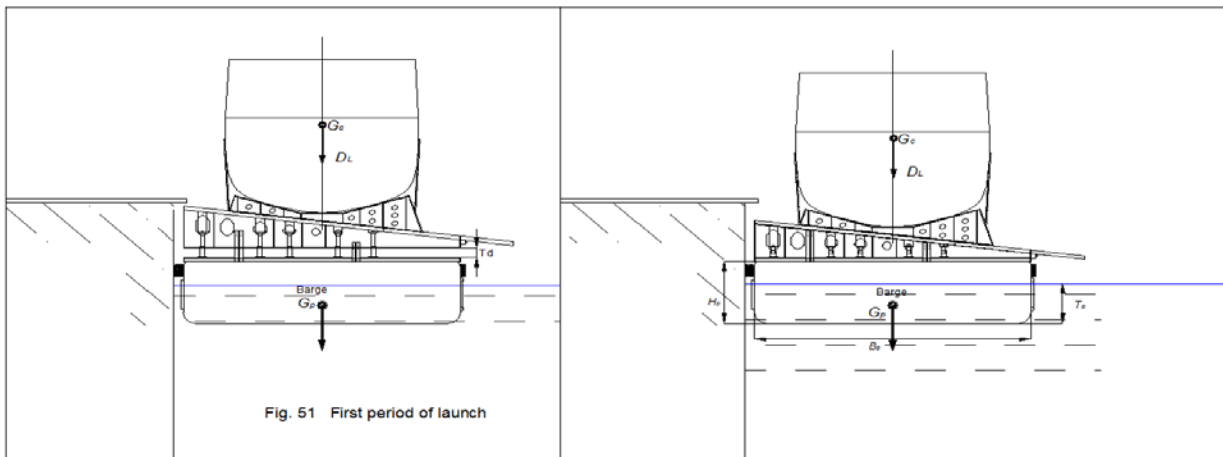
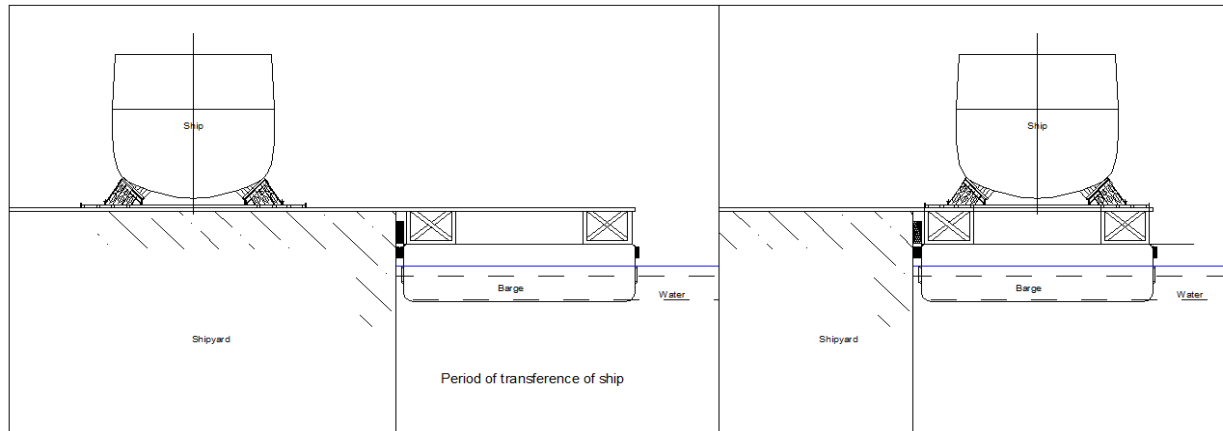
- No slipway,
- Very limited area for building ship sections and a ship hull,
- No floating cranes,
- No economical possibilities to rent a floating deck,
- No permission from the Port Authority to perform a ship launching because of restricted zone of shipping traffic.

## IDEA OF SOLUTION

- I propose the launching solution for all types of ships, which can be applied in a small shipyard with the mentioned limitations.
- The most important part of this study is a development of the ship launching methodology and a proposal to use the original launching device, supported by the numerical analysis referring to the launching process.
- The proposed methodology and designed device can be widely applied in other launching processes.

## PROPOSE OF SHIP LAUNCHING PROCESS

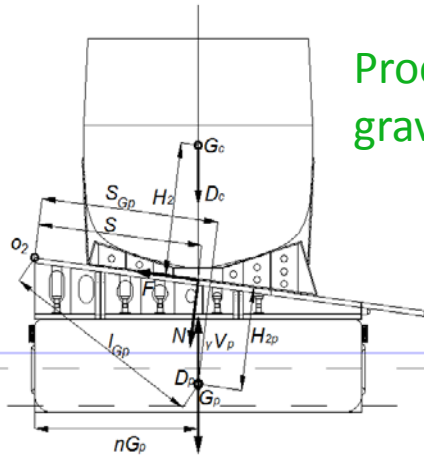
### Steps of Preparation by Ship Launching Process



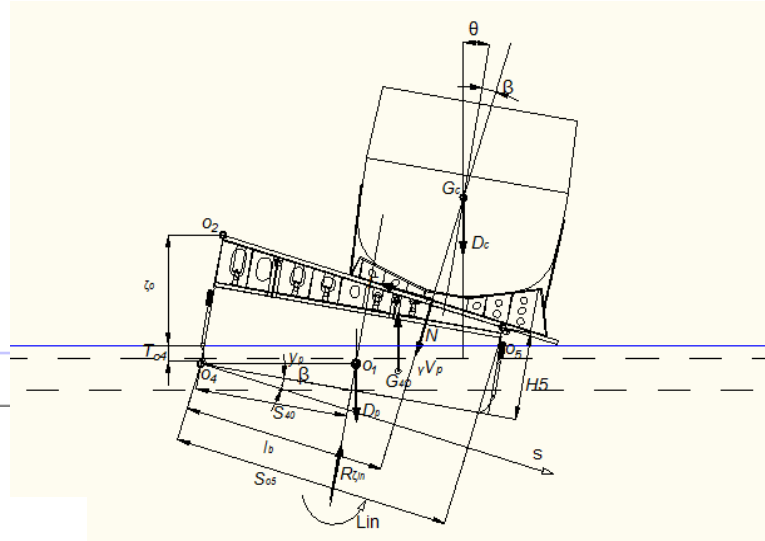
- Election and inspection of launching place
- Positioning of pontoon close of shipyard
- Fixing of keel blocks in the pontoon, is necessary
- Preparation of tracks and rails; application of lubricant grease
- Translation of ship to pontoon
- Change of keel blocks for the portable slipway
- Positioning and fixation of portable slipway below of ship
- Descent level of ship, if is necessary
- Installation of special security ropes all along the slipway and ship .

## SHIP LAUNCHING FROM PONTOON

Process by gravity



Process of Ship Launching



- The ship is towed to the quay
- Dismantled of launching device parts
- Inspection of compartments
- Elimination of defects.
- Completion of construction and testing.

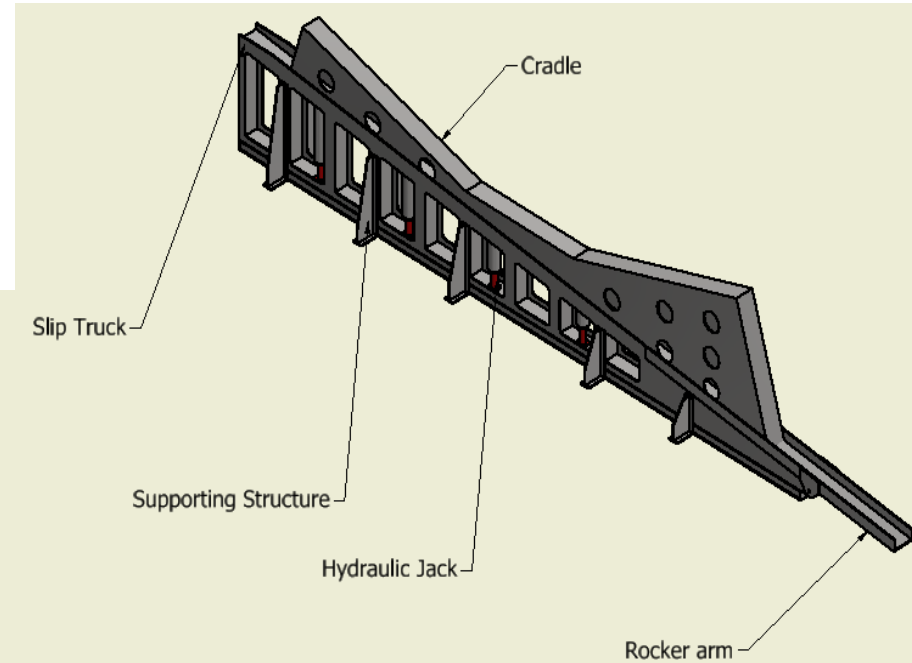
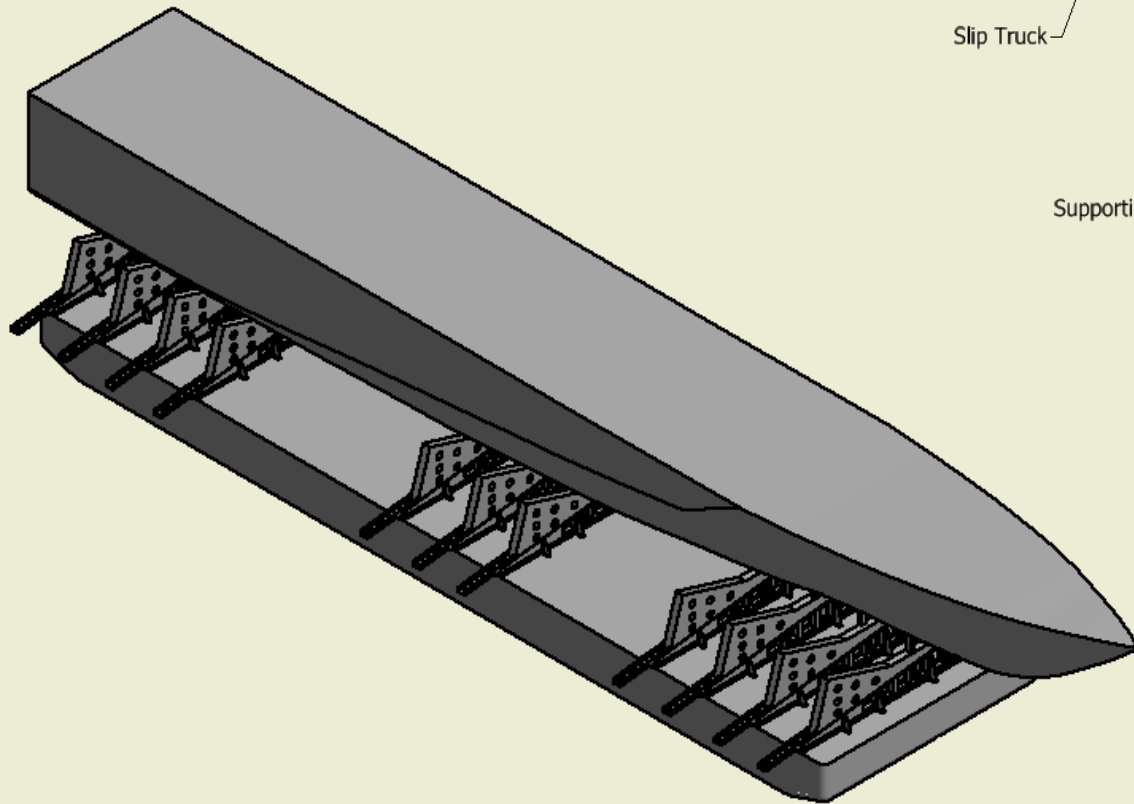


# Ship Launching in Small Shipyards

## MODEL OF SLIPTRACK



## PORTABLE SLIPWAY IN POSITION OF LAUNCH



## DYNAMIC SIMULATION OF TRANSVERSAL SHIP LAUNCHING

To verify the possibility of realizing the ship launching a modeling of this process will be made, considering a ship, a pontoon and a respective portable slipway.

With this equipment, we will model the dynamics of ship launching, obtaining the most important characteristics for this process.

It is possible to show an exact formulation movement system pontoon-ship in polar coordinate  $s$ ,  $\vartheta$ ,  $r$  and  $\theta$  for Lagrange method, taking into account all forces:

For third and fourth period of ship launching:

$$a_2\ddot{s} + a_1\dot{\vartheta} = a_0$$

$$b_2\ddot{s} + b_1\dot{\vartheta} = b_0$$

For fifth and sixth period of ship launching:

$$a'_3\dot{\vartheta} + a'_2r + a'_1\theta = a'_0$$

$$b'_3\dot{\vartheta} + b'_2r + b'_1\theta = a'_0$$

$$c'_3\dot{\vartheta} + c'_2r + c'_1\theta = a'_0$$

# Ship Launching in Small Shipyards

## MODELING OF TRANSVERSAL SHIP LAUNCHING - MATLAB ANALYSIS

### • % DATA OF PONTTON

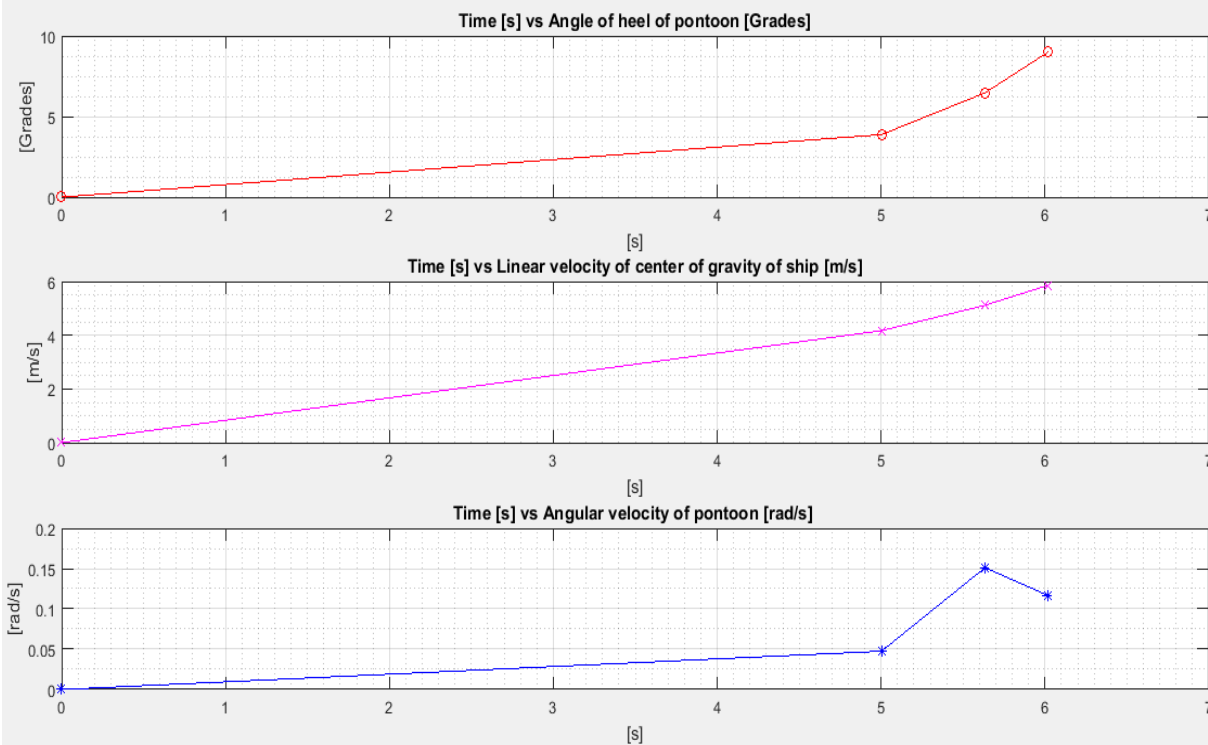
- $D_p=2500$ ; %  $D_p$  = Weight of displacement of pontoon (tn)
- $L_p=65$ ; %  $L_p$  = Length of pontoon(m)
- $B_p=18$ ; %  $B_p$  = Breadth of pontoon(m)
- $T_p=2.5$ ; %  $T_p$  = Draft of pontoon(m)
- $H_p=3.0$ ; %  $H_p$  = Depth of pontoon(m)
- 

### • % DATA OF SHIP

- $D_c=1000$ ; %  $D_c$  = Weight of ship in launching (tn)
- $L=85$ ; %  $L$  = Length of ship(m)
- $B=12$ ; %  $B$  = Breadth of ship(m)
- $T=3.5$ ; %  $T$  = Draft of ship(m)

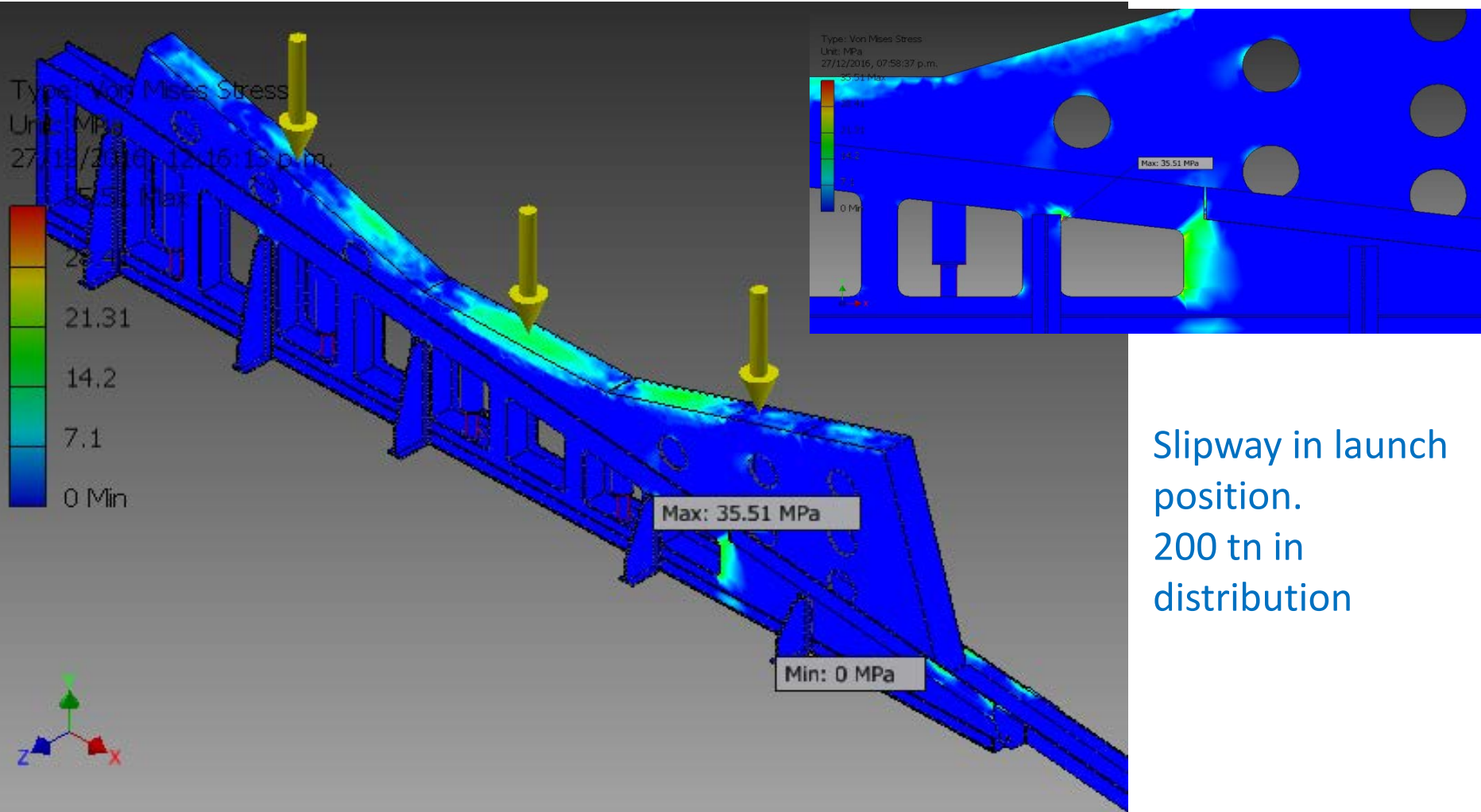
### • Result

- Total time of launch = 6s
- Max.Angle of heel(pontoon)= 9 grades
- Velocity of CG of ship = 5.86 m/s
- Angular velocity of pontoon = 0.12 rad/s





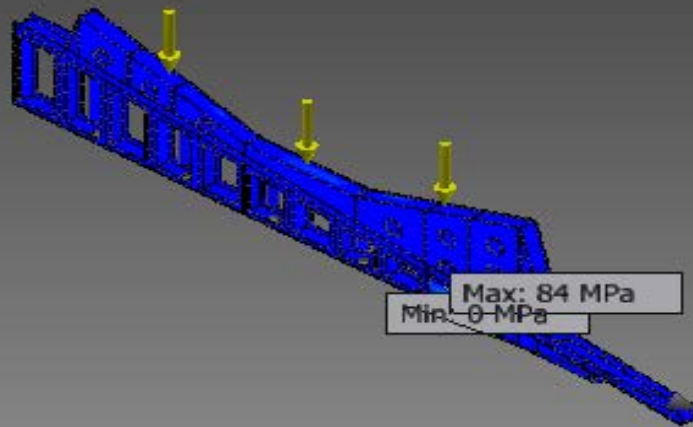
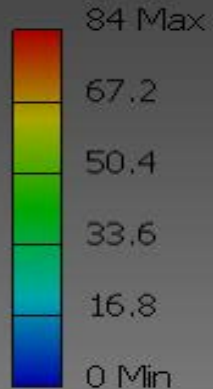
## NUMERICAL ANALYSIS OF STRUCTURE OF SLIPWAY-LAUNCH POSITION



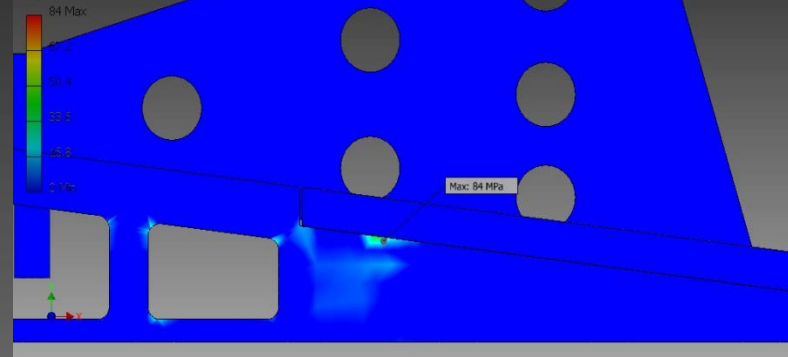
Slipway in launch position. 200 tn in distribution

## NUMERICAL ANALYSIS OF STRUCTURE OF SLIPWAY-DOWN POSITION

Type: Von Mises Stress  
Unit: MPa  
28/12/2016, 02:05:17 p.m.



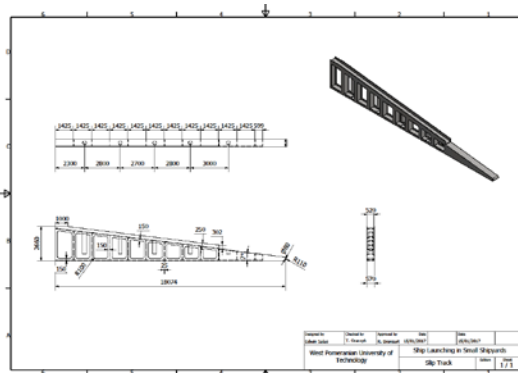
Type: Von Mises Stress  
Unit: MPa  
28/12/2016, 12:43:32 p.m.



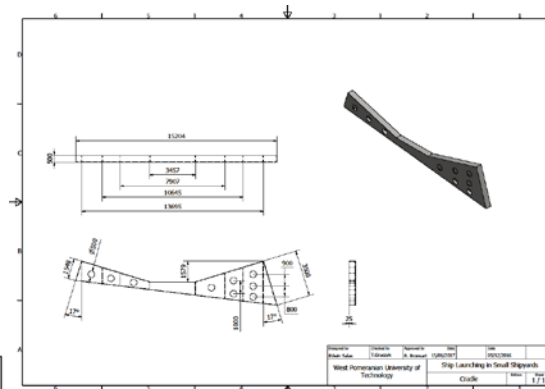
Slipway in down position. 200 tn in distribution. Hydraulic jacks open



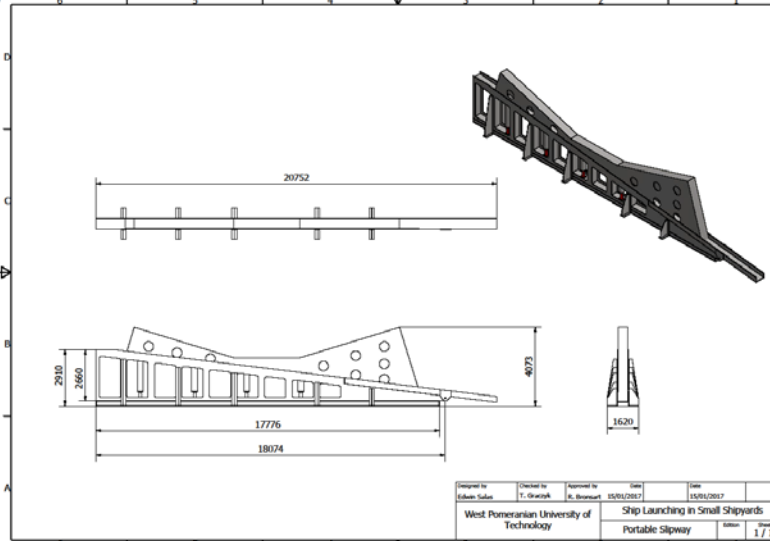
## PORTABLE SLIP WAY-PIECES -ASSEMBLE



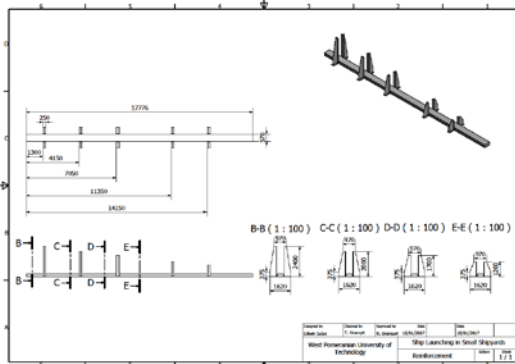
Slip truck



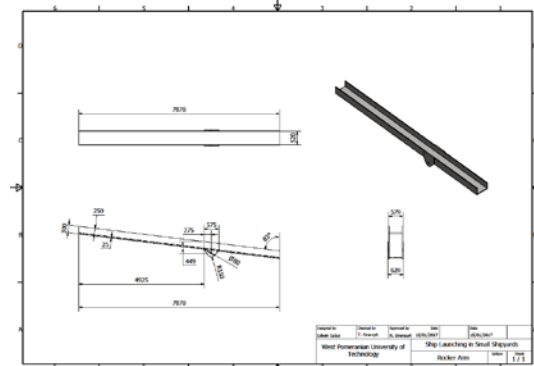
Cradle



PORTABLE SLIP WAY - ASSEMBLE



Supporting structure



Rocker arm

## CONCLUSIONS

- **The procedure of launching boats presented, can be applied in different types of shipyards in different regions of the world.**
- **This procedure can be used in shipyards with launch problems or located in seas, lakes or rivers with traffic difficulties near the shipyard.**
- **With this methodology it is possible to model the launching process even when the ramp, the floating dock or the cranes are occupied, unavailable or tied to other tasks. In addition, this methodology can be used for the launching of metal structures as building blocks for the offshore industry.**
- **This methodology is a new resource for the shipyard because it can release space in the shipyard by transferring the ship that is built or repaired to a different place for launch.**
- **This methodology is flexible enough to be applicable to all types of vessels and in most shipyards, especially small yards. As ships can be moved out of the shipyard, it is no longer necessary to obtain a permit or authorization from the maritime or port authorities, which makes the launch no longer depend on them.**
- **An important result of this project is that the cost is comparatively low compared to other launch methods, since the equipment has a low cost and can be used repeatedly.**
- **The design of the portable platform allows the launch of the ship avoiding an impact or damage between the boat and the pontoon floating. The design allows to transfer the boat to the floating pontoon regardless of the water level, because the cats will adjust the level of the portable slipway.**
- **Finally, this method requires less time for launching the vessel, which reduces the cost, as it only requires a suitable floating float and perhaps tugs. Cranes or a floating dock are no longer needed.**



## THANKS YOU

**INLAND TRIMARAN FOR PASSENGERS AND CARGO**



**PORTABLE DRAG**

