



OCX All Group Meeting 2024

3D Model-based Approval in Reality



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NAPA



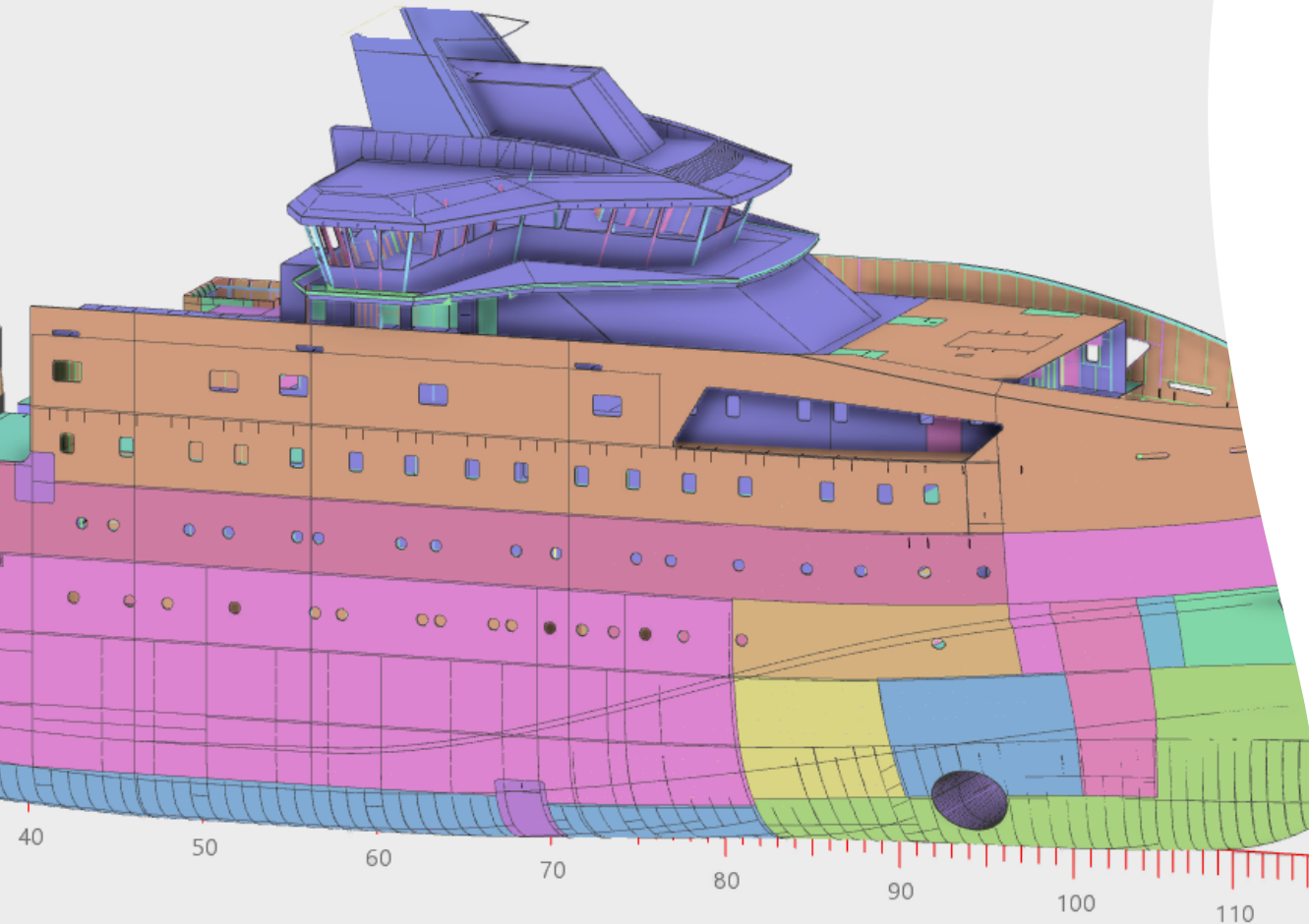
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Vard Design & Engineering



Sverre Olav Bergli

Head of Department
Ship Structures & Stability
DNV AS



Agenda

1. Introduction of joint development project
2. NAPA's strength toward 3D approval
3. VARD – what's in 3DMBA for Designer
Any changes required to designer's way of working?
4. DNV – what's in 3DMBA for Class
Any changes required to the approval process?
5. Are we ready for 3D approval?



VARD
a Fincantieri company



3D Model based approval JDP with VARD/DNV

FEBRUARY 14, 2024

3D-powered efficiency – how VARD delivered a ship design in just 10 weeks

Teams at VARD Design & Engineering were faced with a major challenge: could they slash the typical structural design time by a third, and go from contract signing to class package in 10 weeks? Equipped with NAPA's 3D based tools, they rose to the occasion by working smartly, creatively, and collaboratively. Here's how they achieved this masterstroke of speed and precision.



Commissioning Service Operation Vessel (CSOV) designed by VARD

<https://www.napa.fi/case/vard/>

VARD
a Fincantieri company



DNV

Set-up JDP on 2nd Nov 2023

- ✓ Agreement on the scope, the approaches and the project
- ✓ Done: Rule Calculations, FEM, 3D approval package, revision
- ✓ On-going : comment exchange, process establishment, development



VARD
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NAPA

NAPA's strength toward 3D approval



Compartment Information

Version: 3.0.0

Structure Type Mapping Material Mapping

Cip: VARD

Owner:

Year of build: 2024

Newbuilding Classification Society: DNV

Classification id:

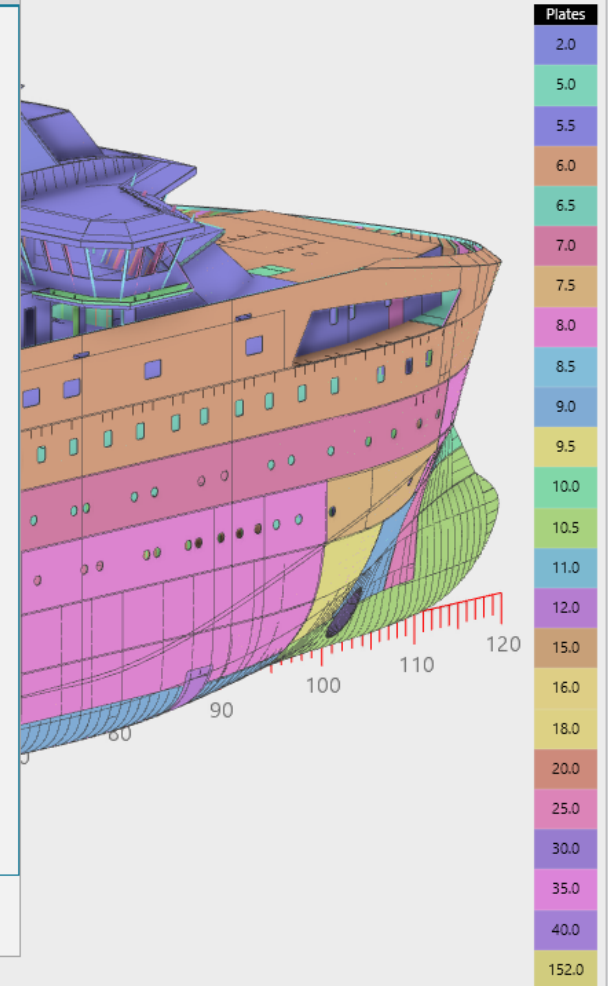
Options

Export panels shown in graphics

Notches in plates Brackets End connections Endcuts

Export compartments shown in graphics

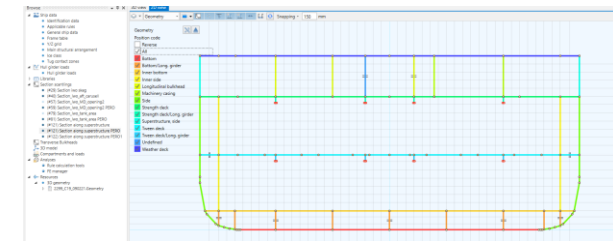
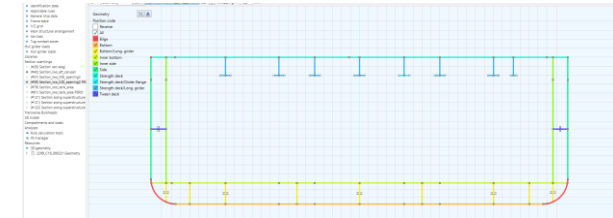
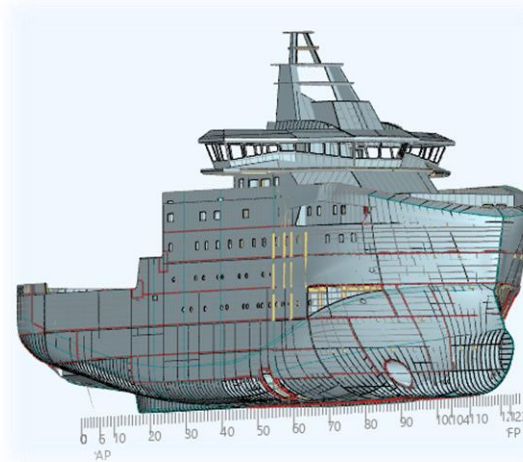
Export... Cancel



3D model for Rule Calculation

- **OCX export in the latest OCX schema v3.0.0**

- ✓ Structure: main objects, stiffener, plates, bracket, and pillars
- ✓ Catalogue: material, profiles, hole
- ✓ Principal particulars and frame systems
- ✓ Compartments: 3D geometry, tank purpose/data
- ✓ Export **only selected/limited by clipping box** (typical section, block view)



Compartments and loads

100% GlobalModel

100%

Comp. category

- Undefined
- Cargo
- Bulkhead
- Other
- Void

Compartments data | Loads

General data Tank data Stowage data Geometry data Container bays data All

Compartment name	Compartment type for container addition	Side	Tank/hold No.	Length (mm)	Volume (m³)	CG distance from AP (mm)	CG distance from CL (mm)	CG distance from BL (mm)	Testing load height, 24 (mm)	No boundary to sea
R006	Void space	C	-1	741.6						<input type="checkbox"/>
R007	Void space	C	-1	1414.5						<input type="checkbox"/>
R009	Void space	C	-1	672.7						<input type="checkbox"/>
R010	Void space	PS	-1	911.1						<input type="checkbox"/>
R008	Void space	C	-1	422.7						<input type="checkbox"/>
ER	Machinery space	C	-1	1197.6						<input type="checkbox"/>
STHR_ROOM	Machinery space	C	-1	724.7						<input type="checkbox"/>
PROP_ROOM	Machinery space	C	-1	324.7						<input type="checkbox"/>
IMDG_STORE	Void space	PS	-1	51.4						<input type="checkbox"/>
STORE	Void space	C	-1	219.6						<input type="checkbox"/>
ENG_STOR	Void space	SB	-1	27.4						<input type="checkbox"/>
EL_STORE	Void space	SB	-1	131.8						<input type="checkbox"/>

Ship data

- Identification data
- Applicable rules
- General ship data
- Frame table
- Y/Z grid
- Main structural arrangement
- Ice class
- Tug contact zones
- Hull girder loads
- Hull girder loads
- Libraries
- Materials
- Profiles
- Connections to PSM (Section)
- End connections
- Shear connections
- Connections (3D model and t)
- Slots
- Brackets
- Tripping bracket profiles
- Welding
- Openings

Frame table (X)

Position of Frame 9

-2659 [mm] [Fwd. of AP]

Frame spacing variation table

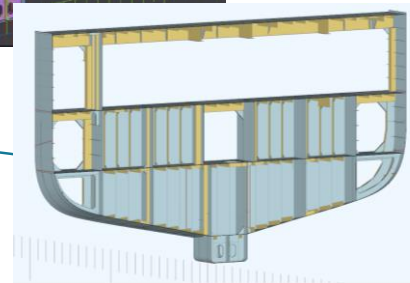
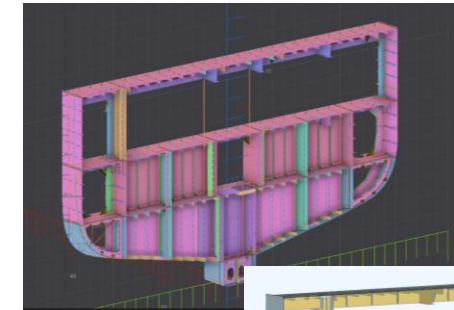
Frame No.	Spacing fwd. (mm)	X [m]	X/L	X _{UL} [m]	X _{UL} /L _{UL}
6	700	0.941	0.0117	0.941	0.0000
104	600	69.541	0.8659	69.541	0.0000
123	600	80.941	1.0000	80.941	0.0000

Standard openings

Name	Height	Width	Radius
800x600	800	600	300

Two radii openings

Name	Height	Width	Bottom radius
850x650x220	850	650	220



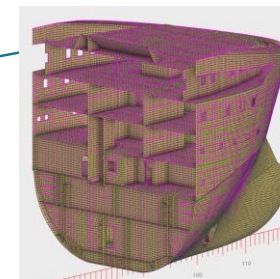
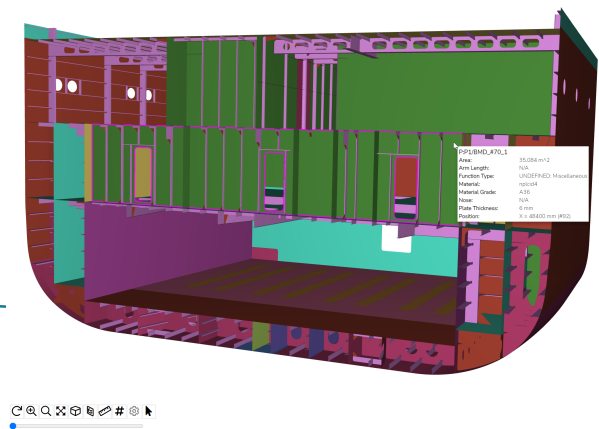
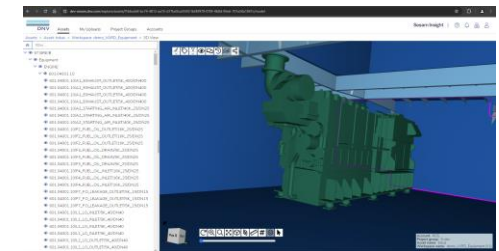
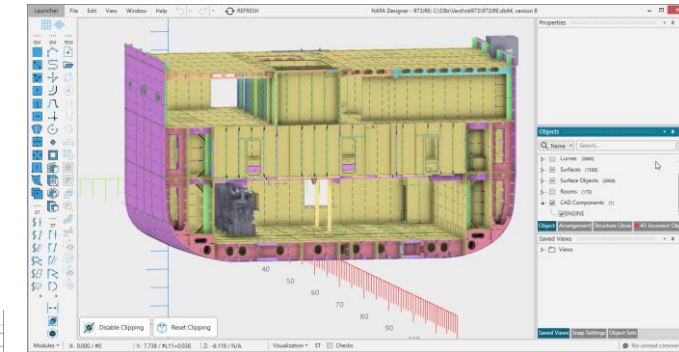
Class package for 3D approval in DNV

- **OCX export in the latest OCX schema v3.0.0**

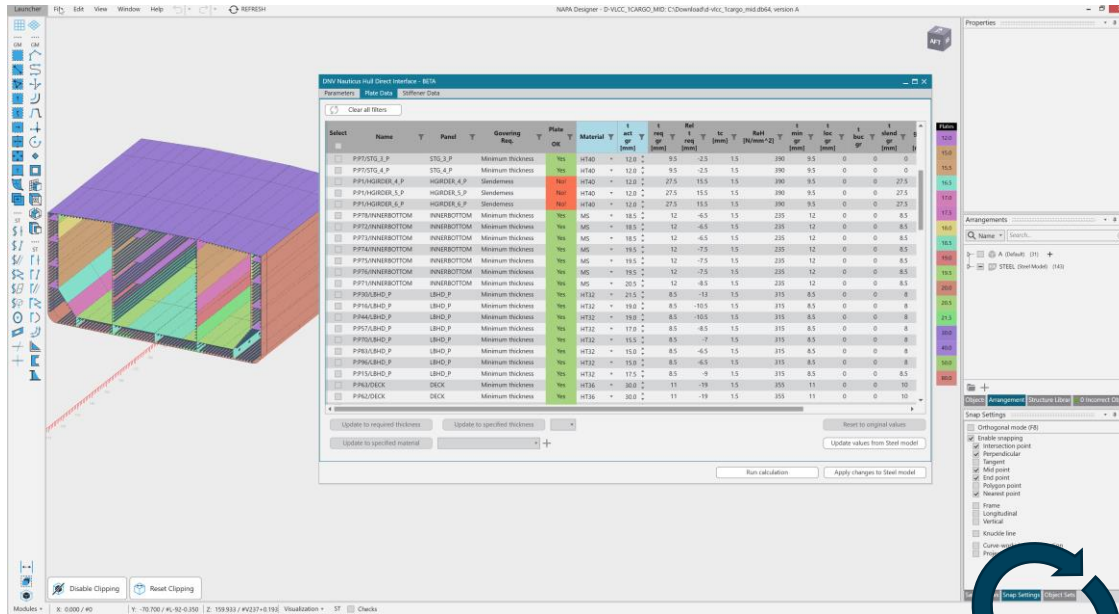
- ✓ Export structure detail with CAD files (Step) as geometry references (OCX+ Step files)
- ✓ Details: End connections, slots, lug plates, notches and end cuts of stiffeners
- ✓ **Export equipment as CAD component**
- ✓ Steel arrangement as Design View
- ✓ Synchronization over OCX submit (revision control purpose)
- ✓ **Custom properties in structure (plate, stiffener, bracket), LABEL – main object**
(e.g: corrosion addition, longitudinal stiffener number)

- **FEM model to GeniE**

- ✓ Export .fem file (FEM model + FE Grouping by compartment, main object, steel arrangement)



Design iteration in Design tool



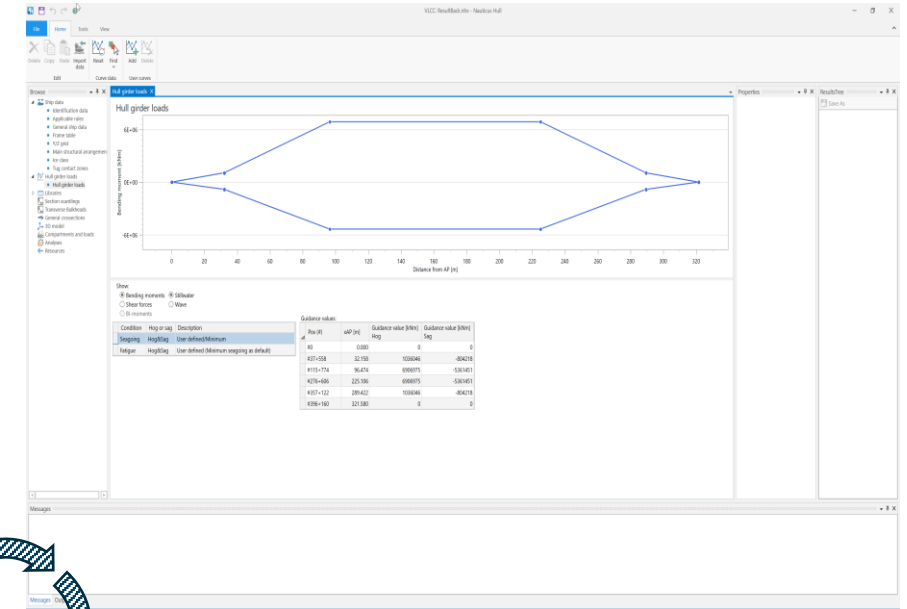
NAPA Designer – Steel 3D model

Scantling Changes+Run

3D Model (OCX) Section and setting(.js)



Result
(xml)



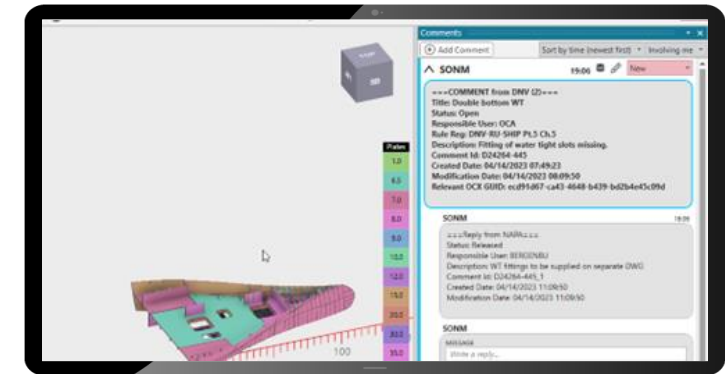
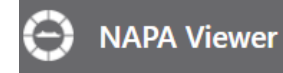
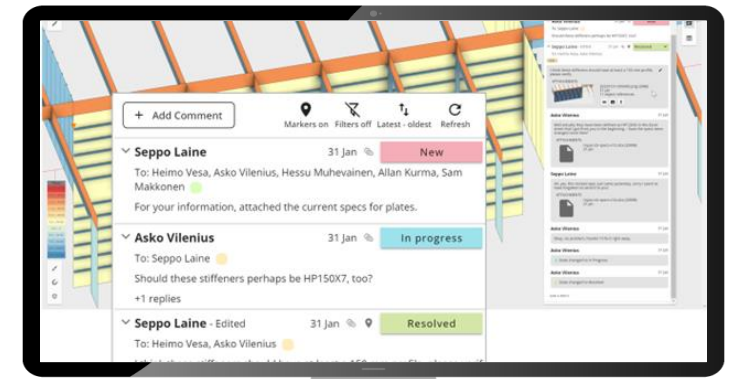
DNV Nauticus Hull – Workspace

(general info, rule, hull girder loads, compartments)

Background
Rule check

- ✓ Rule calculation in NAPA Designer based on DNV Nauticus Hull
- ✓ Design iteration of scantling can be possible without leaving NAPA Designer until it satisfies the rule requirement

Comments exchange



- **Feasibility study**

- ✓ Export comments in DNV Sesam insight to JSON file
- ✓ Import comments JSON file to NAPA Designer by scripting
- ✓ Synchronization commenting NAPA Designer and NAPA Viewer (2024.1)

- **Future work**

- ✓ Interactive comments exchange using DNV commenting web API

3D Model-based Approval in Reality

VARD – what's in 3DMBA for Designer
Any changes required to designer's way of working?

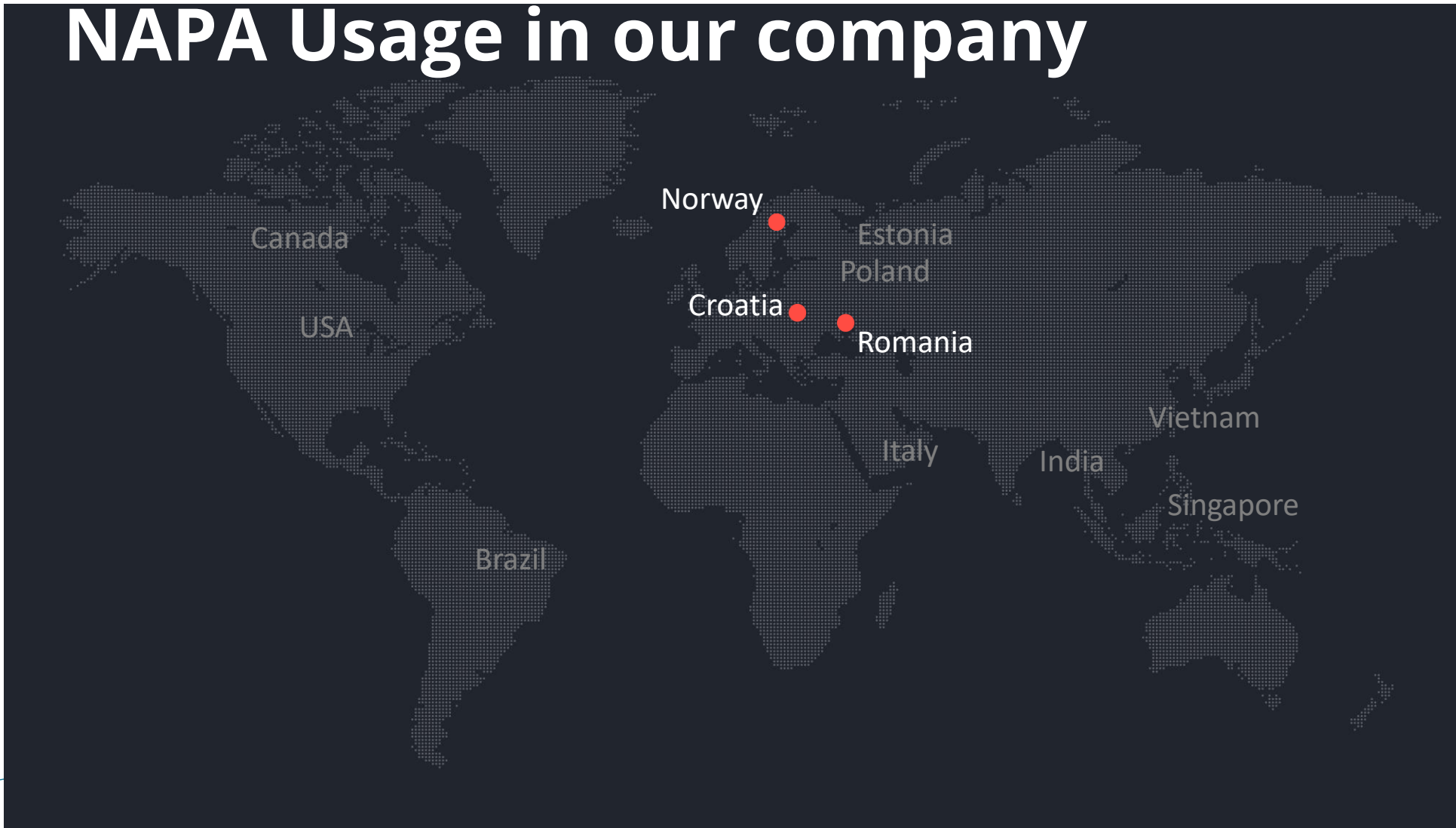
Florin-Ciprian Luli



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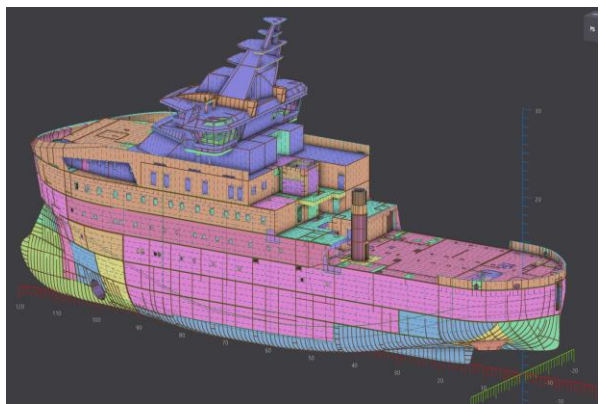
NAPA Usage in our company



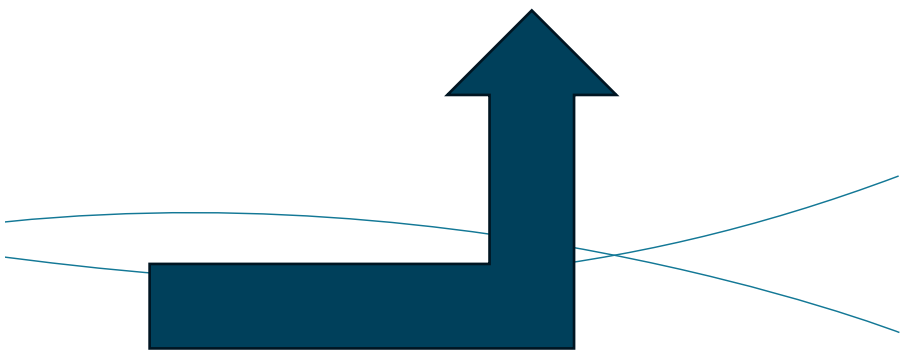
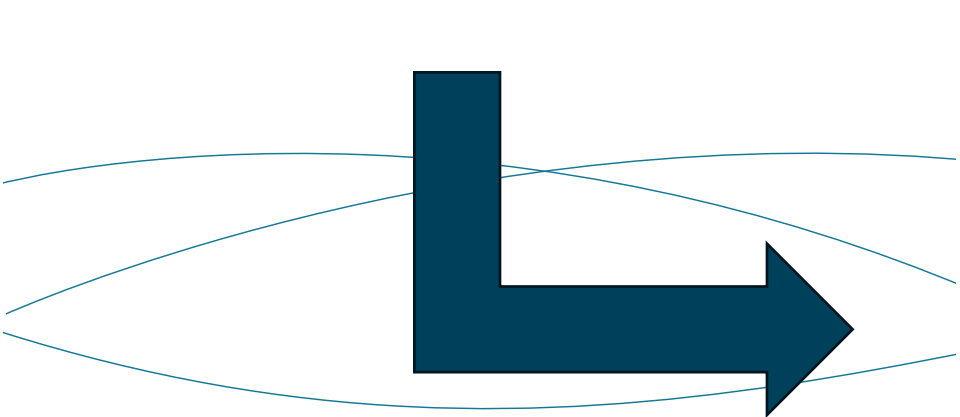
We are working worldwide – We are using NAPA in 3 locations to develop our 3D models



Close cooperation Napa –Vard - DNV

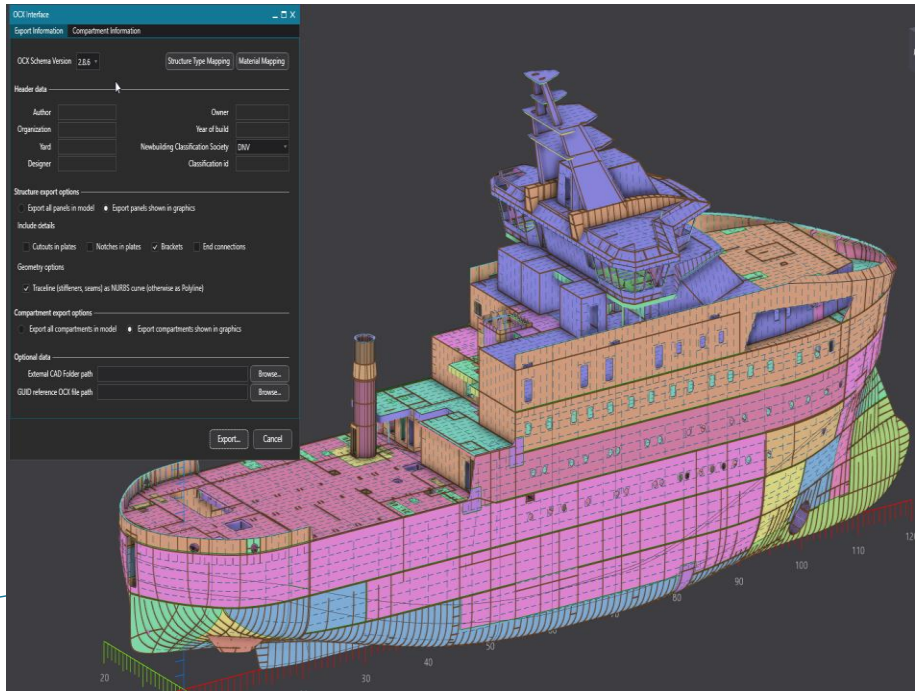


Outcome – Live 3D Model

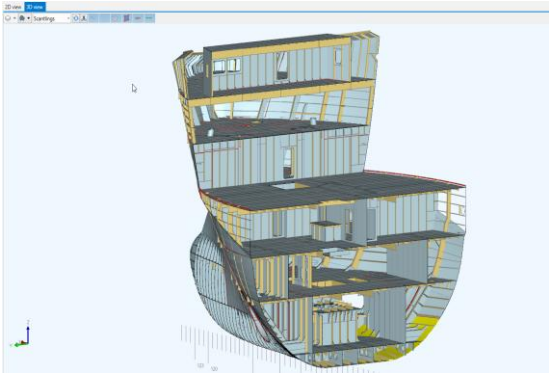
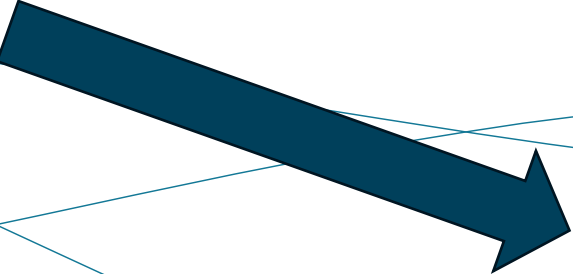
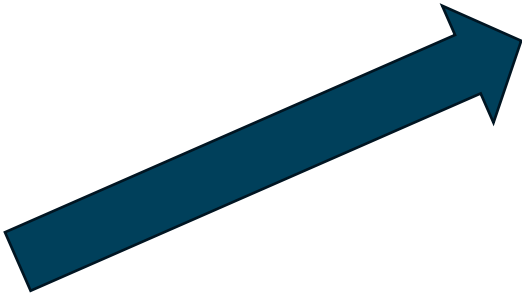


3D Model – to be used in different software

Purus Wind-N973

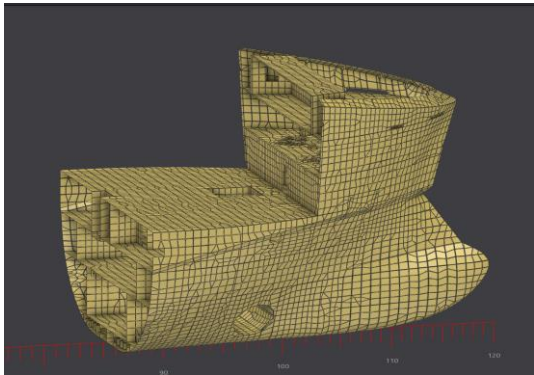


Live 3D Model – main base for other exports



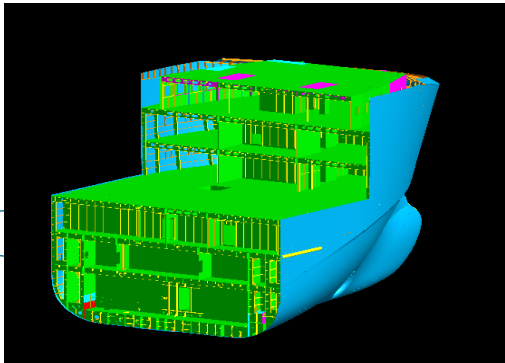
OCX file

Import
Nauticus
Hull



FEM file

Import
GENIE

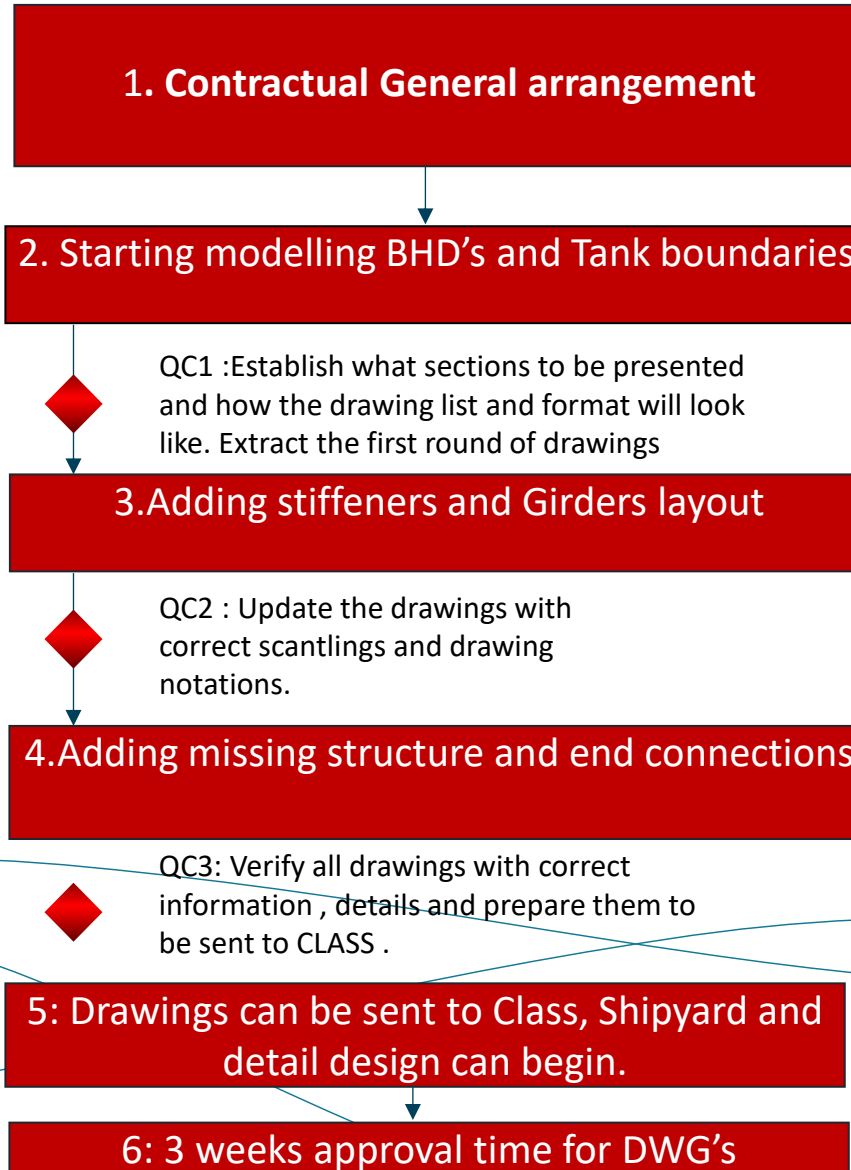


Aveva import

Import
AVEVA



NAPA model developed by VARD.



NAPA model prepared for OCX.

1. Contractual General arrangement

2. Starting modelling BHD's and Tank boundaries



QC1 :Share database as OCX file with DNV
Establish detail level for most important sections on ship.

3.Adding stiffeners and Girders layout and
Comments from CLASS



QC2 : After this iteration we can add all the
scantlings and comments from QC1 from
CLASS society

4.Adding missing structure and end connections



QC3:Prepare the model as detail as needed with all
brackets and connections (focus on discussed sections).
Implement CLASS comments and prepare export as
OCX file. 3D model to be sent as MAIN class model and
also as UNIT PLAN

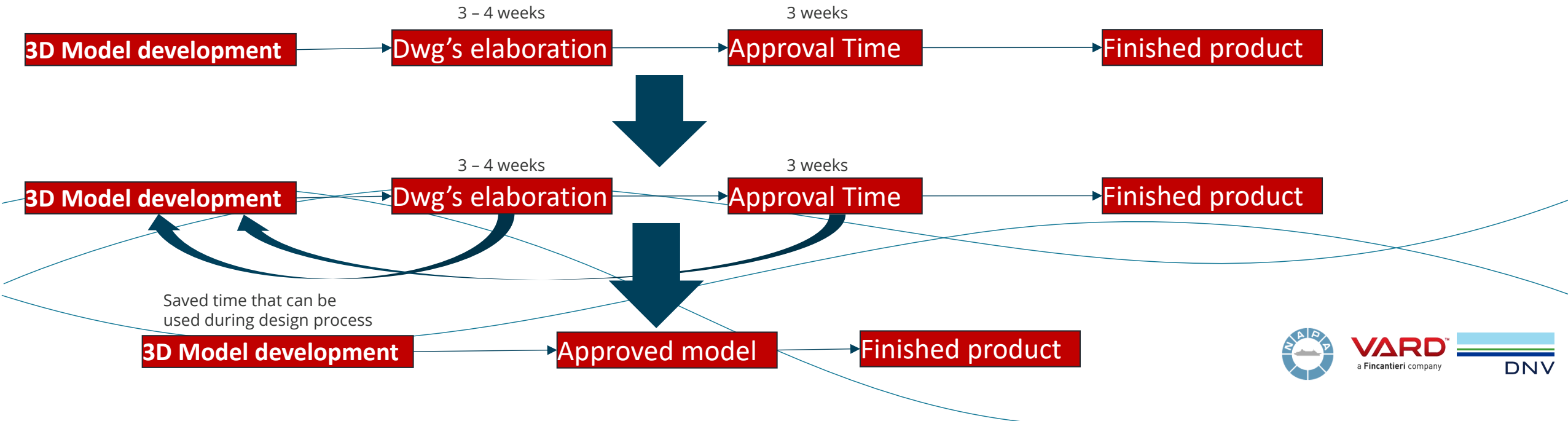
5: 3D model finished . Sent to class with all
comments implemented and also to shipyard.



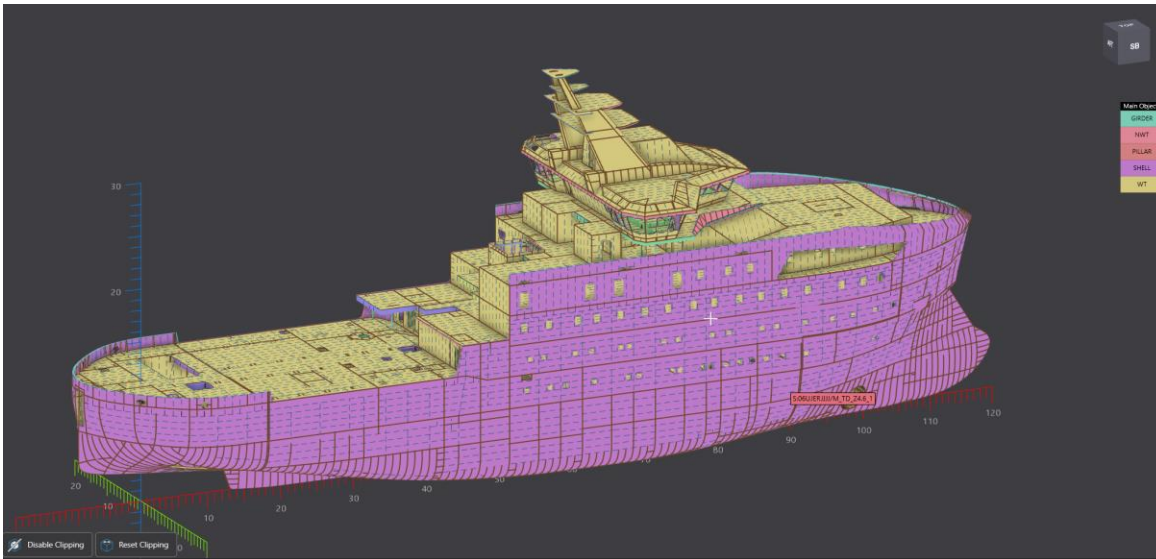
Differences between DWG and OCX.

Our main purpose is :

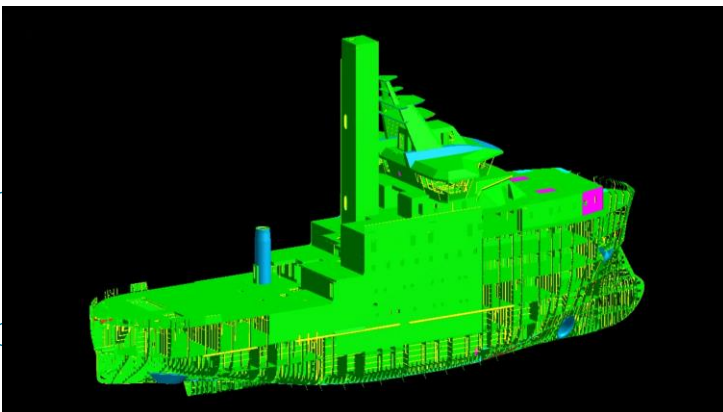
- Try to use the time that the Class takes to approve DWG's (3 weeks) – during design process
- Try to use the time needed to extract the DWG's - during the design process.
- Try to achieve a detailed 3D model to be shared with Class and Shipyards.
- 3D model that can be used in Detail Design.



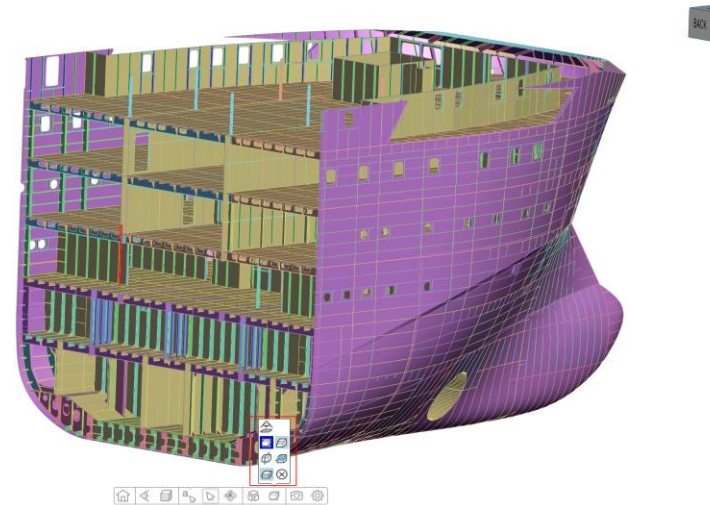
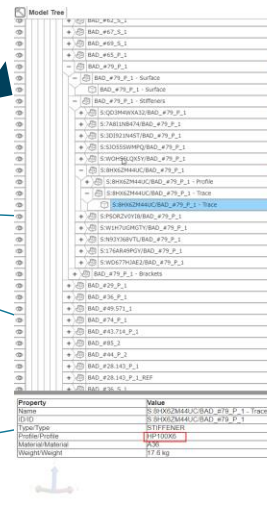
Model prepared for OCX.



3D Model – developed for OCX



- Aveva import – shell is not transferred , but all other elements are present.



- It will be a detailed modeled with focus on Class comments and interest areas.
- Will be the base for Detail Design – import to aveva and model for designer to see (replacement for dwg's).
- We will be focused on sending only one file OCX, so all the effort will be on how good the model will be.
- Effort in reducing approval time , implement the comments during 3D modelling.
- Try not to make big changes on how we are working right now. (develop the structure library as Nauticus .)

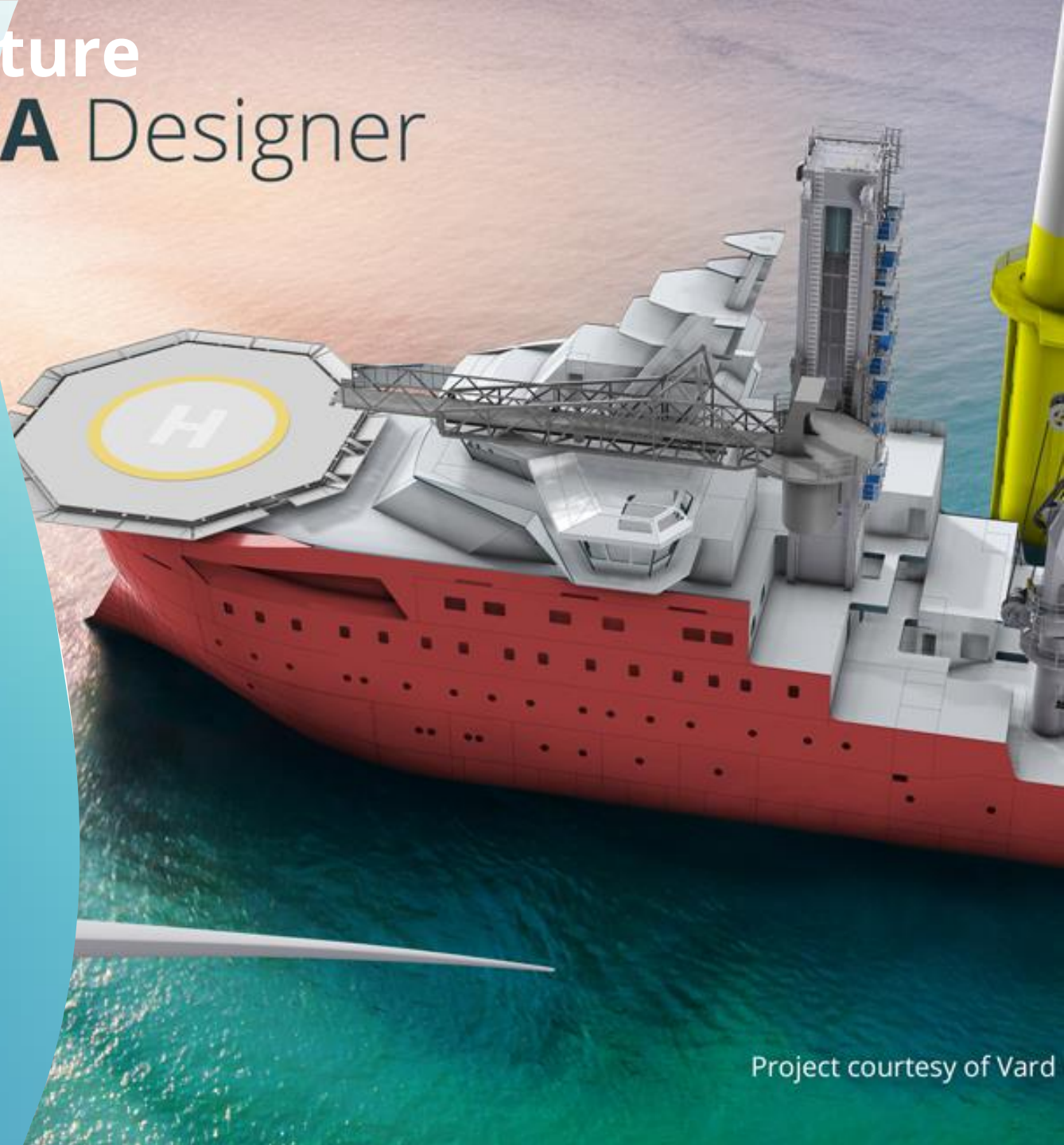
- Napa model can be generated as HTML file , or used in NAPA viewer so that the DETAIL DESIGN team can see the entire model , and have a base to start modeling
- The export can be done as unit so that is more easier.

VARD works towards the future

3D Designer

Conclusions:

- We need to improve ourselves – 3D OCX file is close to be finished
- Is more convenient to have a 3D model than DWG's
- The model developed by Designer to be used as base for other software
- The information will be stored only in one place



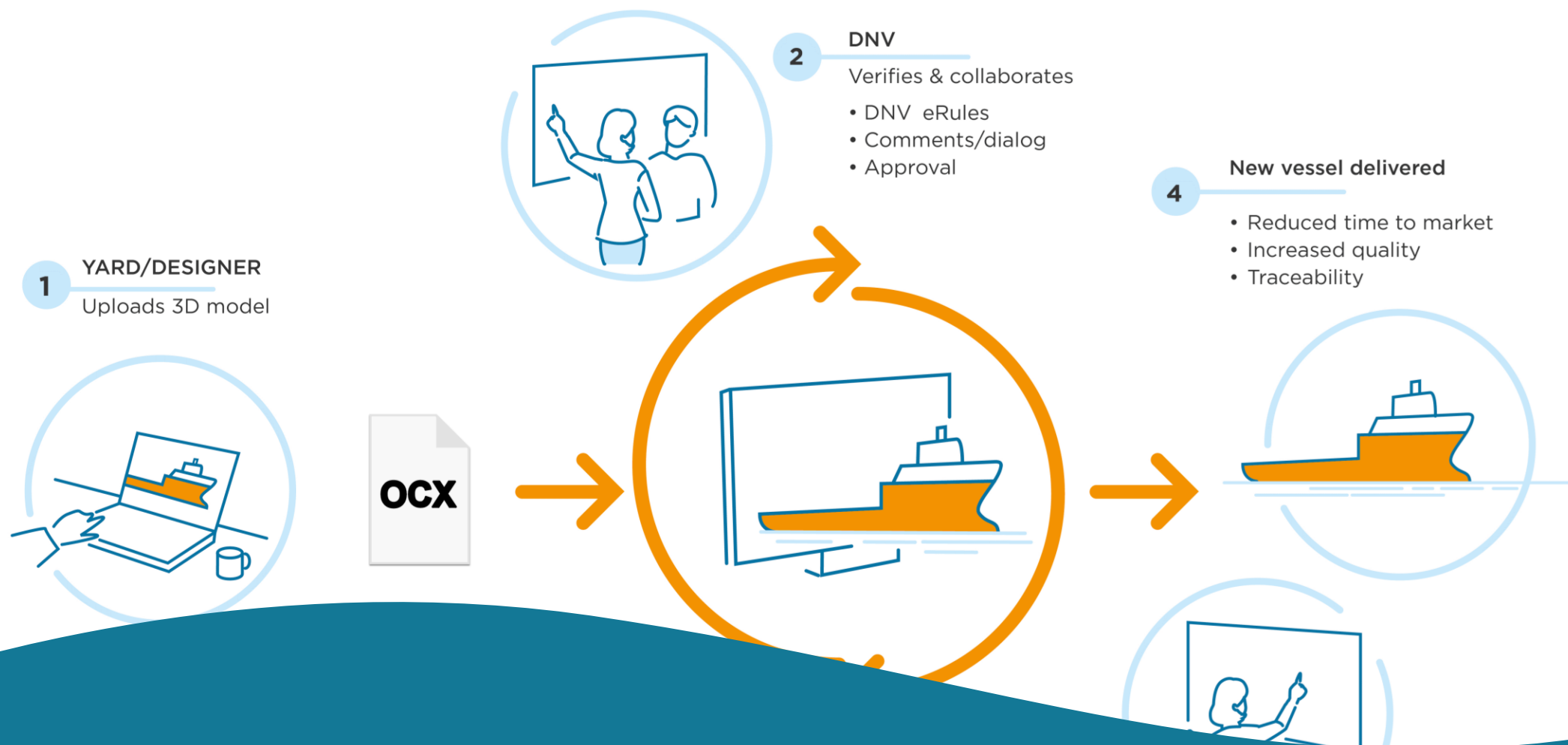
VARD
a Financier company



3D Model-based Approval in Reality

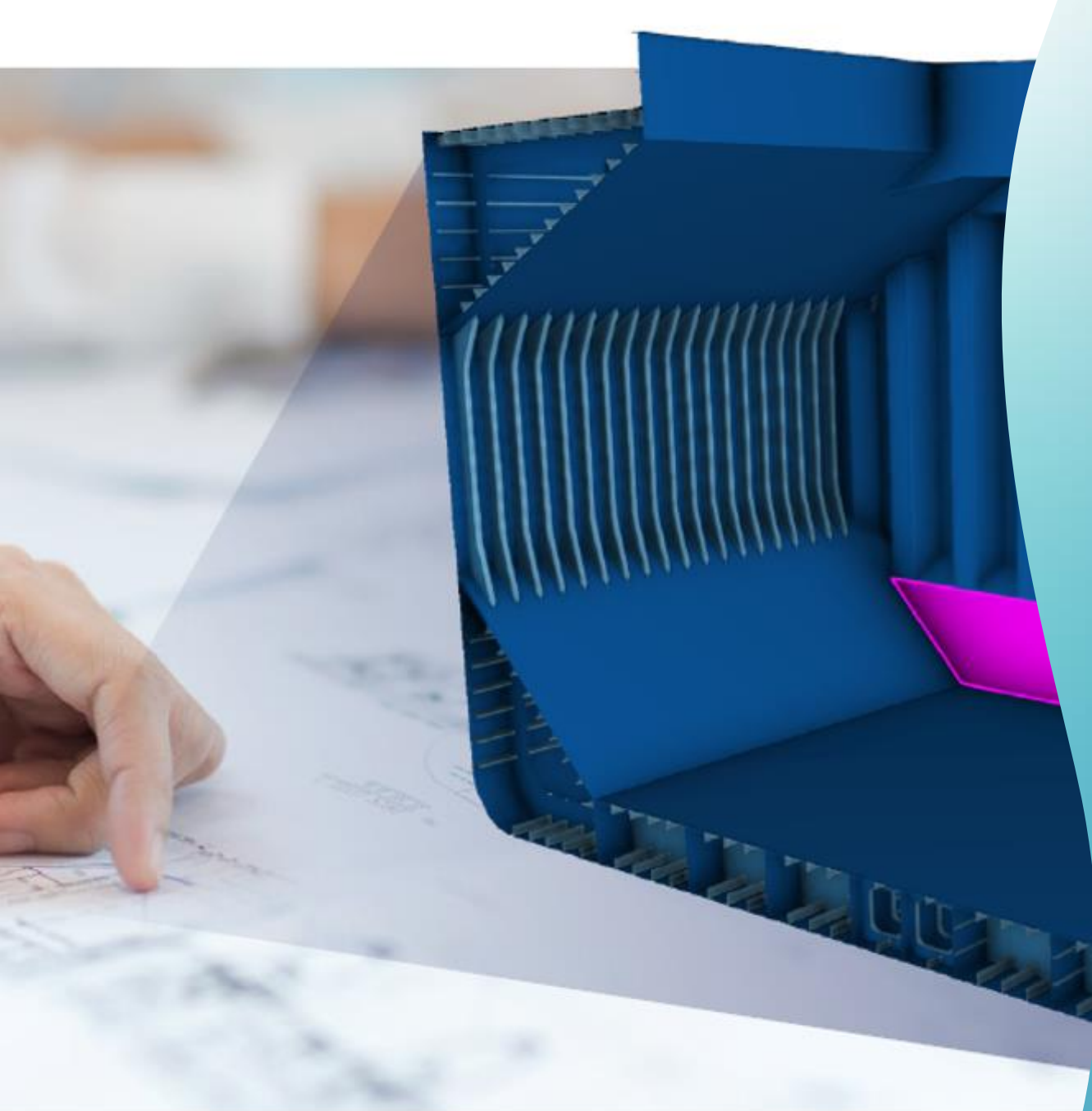
DNV – what's in 3DMBA for Class
Any changes required to the approval process?





Model Based Approval with DNV

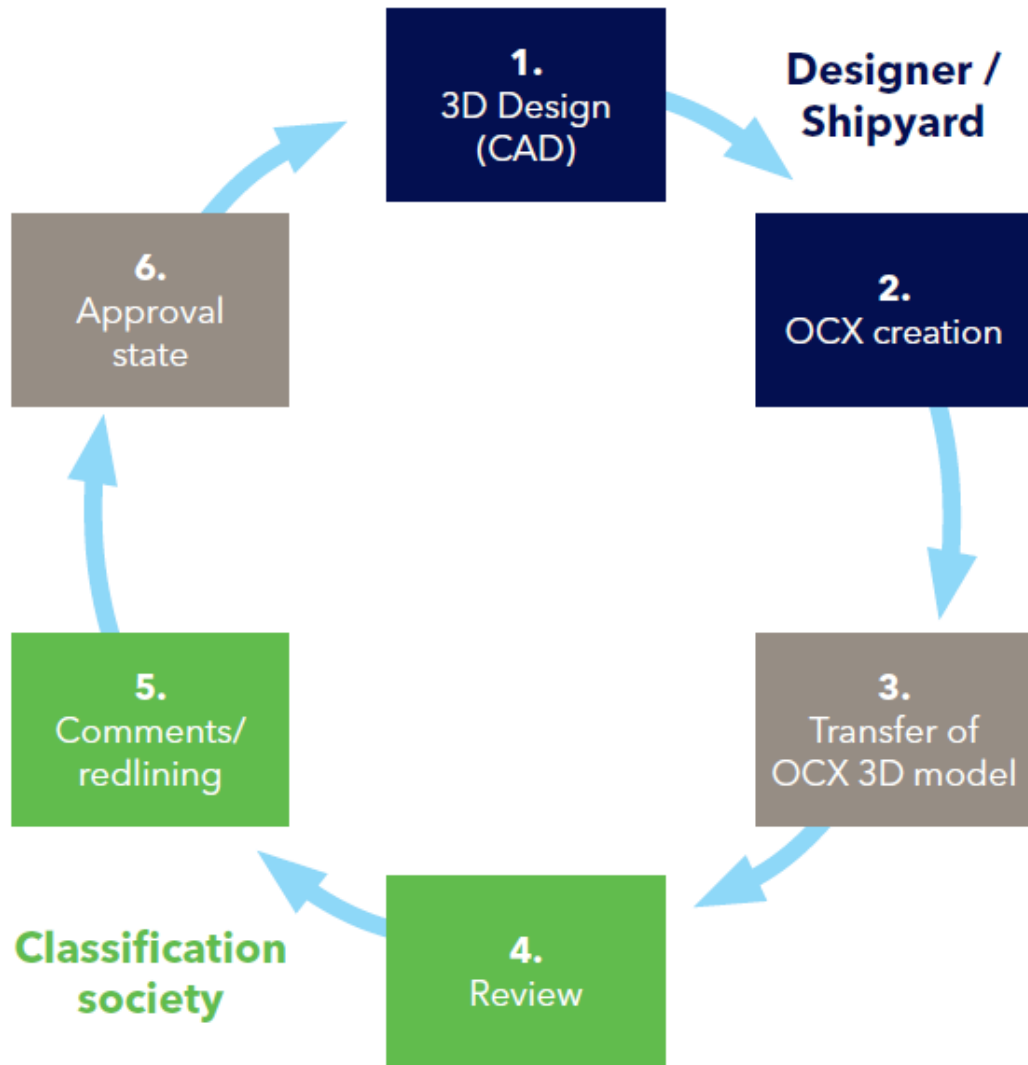
Sverre Olav Bergli



MBA benefits

- reduce shipyard workload with fewer drawings to create,
- improve quality and achieve a common understanding of design and class comments by using a 3D design representation directly,
- optimize the calculation process by directly interfacing the 3D design model with calculation software.
- improve the transparency and support for automation and increased self-service.

SEAMLESS MODEL EXCHANGE WITH CLASS



Feed forward (from designer/shipyard)

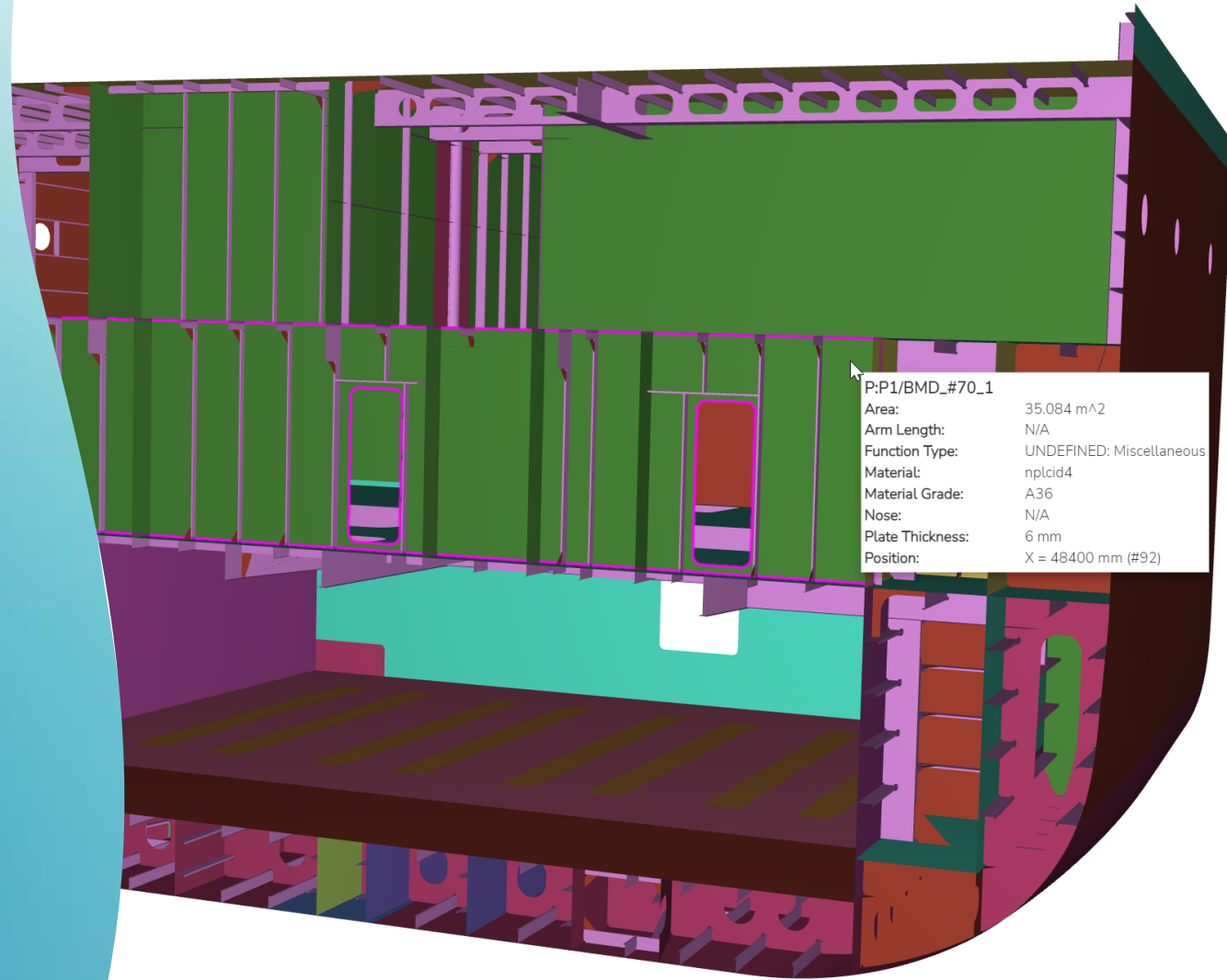
- Digital design documentation
- OCX replacing structural drawings
- Traditional documentation must be submitted for information not included in the OCX

Feedback from DNV

- 3D markup: Comments/redlining
- Comments are available for designer/Yard in the customer portal (Veracity) immediately when published by the approval expert
- Comments can also be provided directly in the originating CAD system through integration with the DNV comment API

MBA – What to be submitted

- Approval file (3Docx including + STP part)
- Calculation file (3Docx)
- Description of 3D model
- General vessel information – Design parameters
- Supporting documents



The following information shall be included:

Parameter	OCX support
length of ship L	✓
greatest moulded breadth B	✓
moulded depth D	✓
mean moulded summer draught T	✓
block coefficient CB	✓
maximum service speed V	✓
frame table	✓
main structural arrangement	✓
class notations	✓
hull girder loads	

The OCX format supports 22 ship principal particulars

General vessel information -Design parameters

General information regarding the vessel may either be supplemented in the 3Docx model or separate document.

Supporting documents

- Design load plan
- Tank and capacity plan
- Welding tables
- Structural details (if not shown on 3D model)



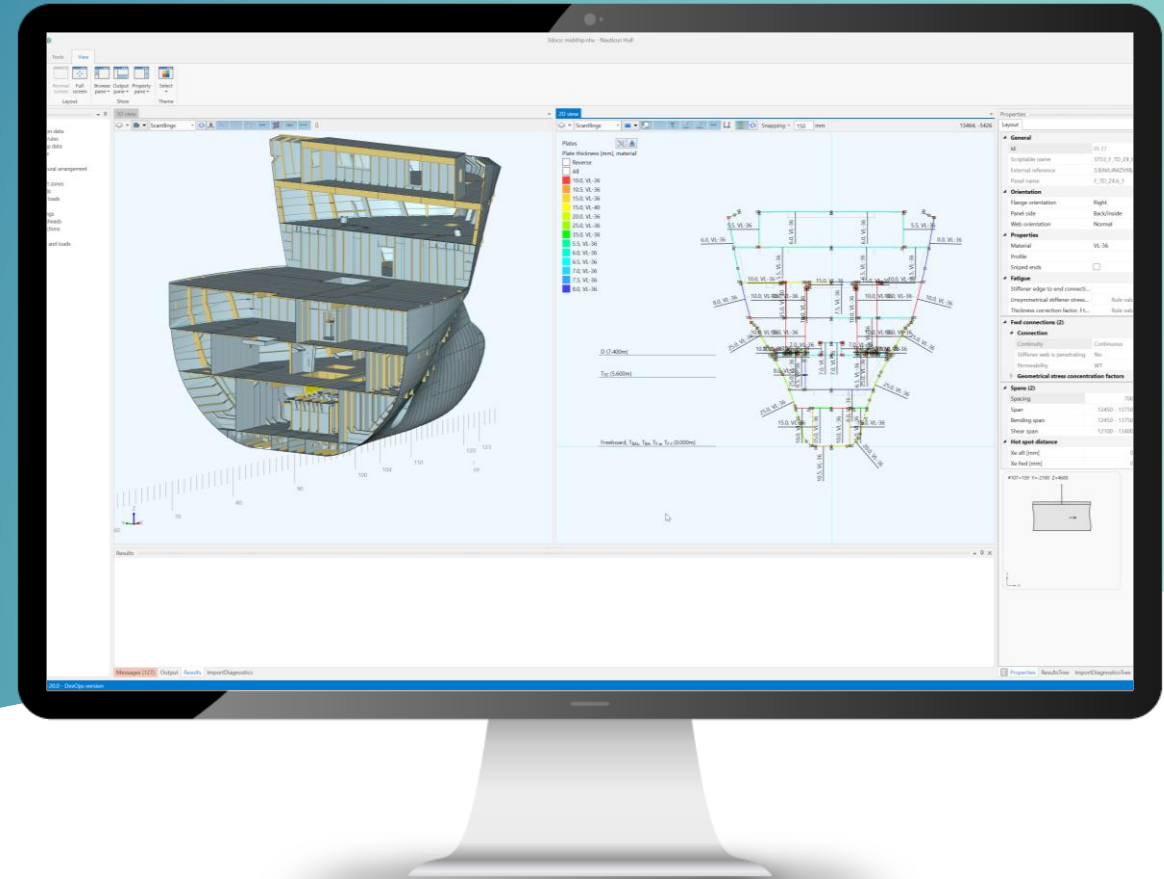
Nauticus Hull

Benefits designer

- Run prescriptive Rule check by using the OCX file exported from NAPA Designer
- Single source of truth,
- Efficient design iterations and optimization.

Benefits DNV

- Time saving
- Less prone to manual errors
- Same information as in Sesam Insight



Workspace: P49367-2 > 3D View

filter...

> PNO2680 M97 JAA AUST

VTF cases (0)

Attachments (0)

Points of interest (0)

> Properties

> User defined sets (1) +

✓ User planes (4) +

CL

Main Deck

TweenDeck

Y: 0.0

✓ Grids

> Grid X

> Grid Y

Comment and red-marking



- DNV has developed the web based Sesam Insight tool for commenting and red-marking the 3D model
- Sesam Insight is available for designer/yard in the Veracity customer portal under Classification of Newbuilding
- The designer is notified and can see comments/red-marking immediately in the Sesam Insight when the approval expert publish the comment
- Designer/yard can also reply to each comment in the portal to quickly resolve the feedback from DNV

Comments

Add

Search Comments

Comments

Add Comment

Title*

Radius

Category*

External Comment

Type*

Action Required

Disciplines*

H1 Structural

Rule/Reg

DNV-RU-SHIP Pt.3

Issued through*

NB Approval Expert

Responsible user*

Madsen, Anders

To be closed by*

NB Approval Expert

Description*

Radius 640mm, see markup on Main Deck

Linked Parts

Manage parts (0)

Select part(s) in the 3D view to attach.

Adding...

Cancel



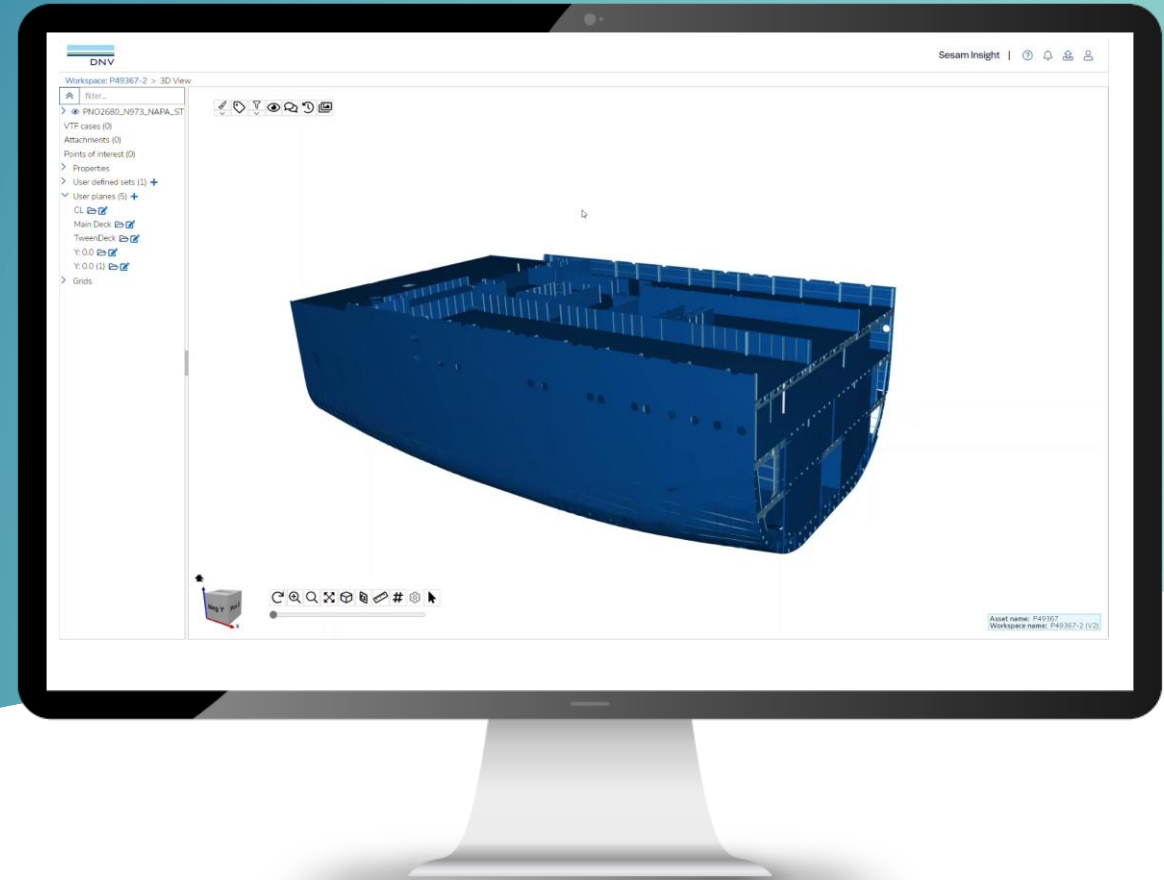
Comment Review by VARD

Benefits designer

- Immediately see published comments in the customer portal
- View 3D comments with 3D markup in Sesam Insight
- Directly reply to individual comments (text and attachments)

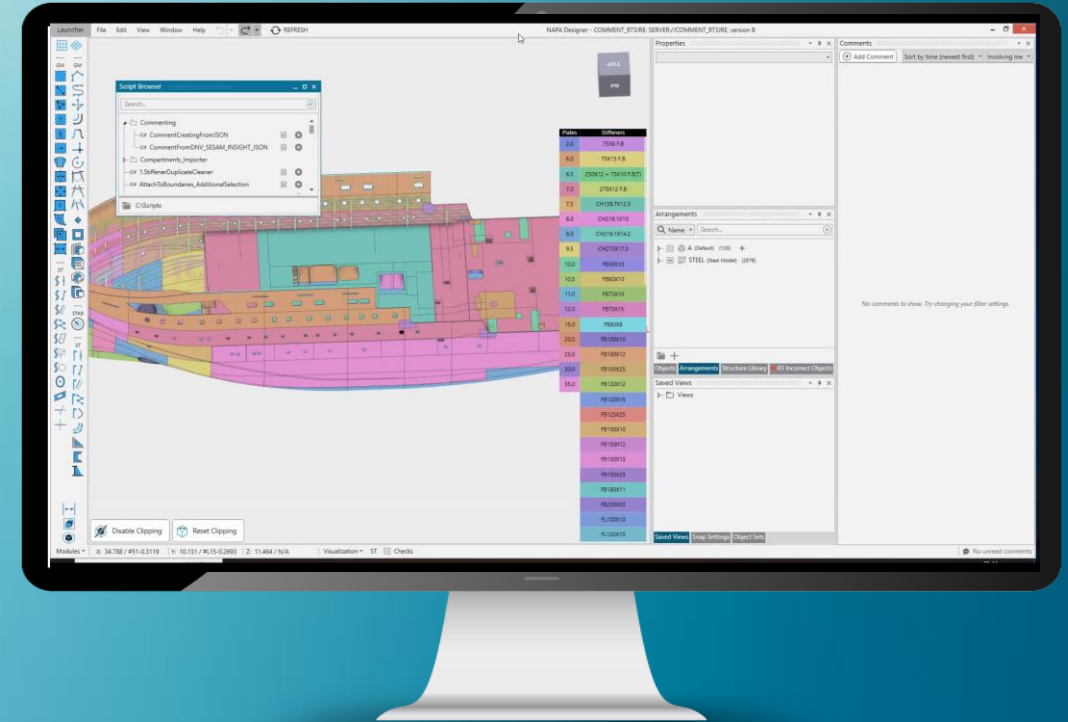
Benefits DNV

- Time saving
- Engage with designer early
- Quickly close open comments



Comment and red-marking API

- DNV has also developed a comment API for 3rd party application access to comments
- Using the API, comment status/comment feedback can be made available inside NAPA Designer and NAPA Viewer
- The API provides two access modes:
 1. Comment status (one way API)
 2. Interactive (two-way API)





Site Survey – Closing the loop

For the construction yard and the site surveyor

- Drawing-less block surveys using offline 3D model on a portable device
- Full 3D model with all attributes and comment status
- 3D comments and red-marking is available
- Comments from plan approval with 3D location to be closed by surveyor



Thank you!

IF YOU HAVE WANT TO DISCUSS MORE,
PLEASE CONTACT:

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Ciprian.luli@vard.com

Sverre.Olav.Bergli@dnv.com