

NSRP RA Project 2019-483-011

Automated Detail Planning and Integrated Shipyard Operation with Engineering Data

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Business Technology & SDMT Joint Panel Meeting
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Project Team



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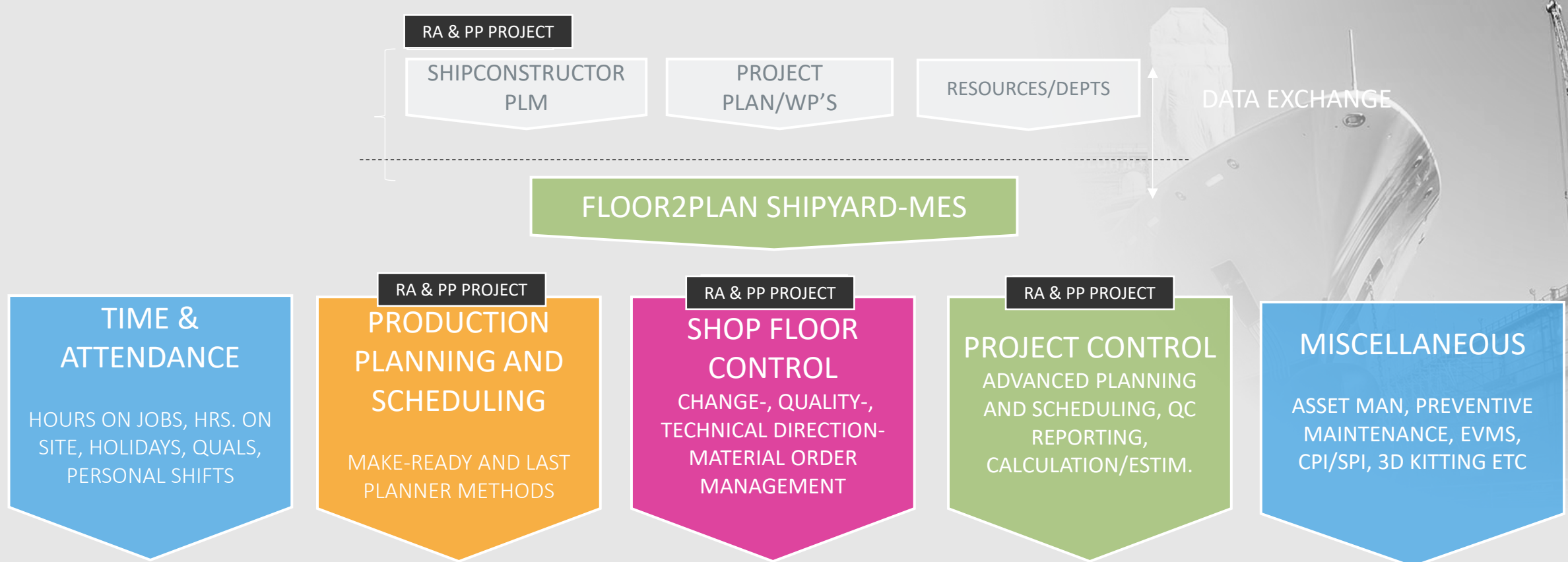
Project Objective

- Stand up a pilot program of Floor2Plan at each participating shipyard to research how to improve the shipyard efficiencies for higher levels of competitiveness (cost-price and lead-time) through digitization in engineering, organizational, and physical shipbuilding processes using an integrated Shipyard Manufacturing Execution System (MES) platform

What is Floor2Plan?



NSRP RA AND PANEL PROJECTS



Data Flow RA Project (ongoing)



Engineering Model

Data

Data



SHIPBUILDINGPLM™



ENTERPRISEPLATFORM™

Meta data

Meta data



What happens in Floor2Plan

The Goal: Generate automated detail planning

- Metadata utilized to create Jobs/tasks with
 - Budgets
 - Timeslots
- The automation creates more granular planning
- Enables better progress reporting
- Methods for better shop floor control

What happens in Floor2Plan

The Goal: More robust earned value management

- Metadata utilized to generate earned value reports
- The automation creates more granular report data
- Allowing for instant up to date Earned Value reports



Panel Project (Completed)

Phase 1 Overview

- SSI and Floorganise conducted value stream mapping of information at each of the participating shipyards
- Captured business processes and data requirements of each participant
- Targeted groups at the shipyards included: Engineering, Production, IT, Planning and Project Control Processes
- Floorganise and SSI defined the data available to export from ShipbuildingPLM™ to the Floor2Plan Tool
- Floorganise and SSI held a workshop for project team members to demonstrate the workflow using SSI commercial ship data



A worker in a white hard hat and blue shirt is looking at a tablet. The tablet displays a software interface with a grid of colored tiles (yellow, red, green, blue) and icons. The background shows a large ship hull under construction, with scaffolding and the word 'BLOHM' visible. The text 'ShipbuildingPLM™ Data import' is overlaid in white.

ShipbuildingPLM™ Data import

Importing data

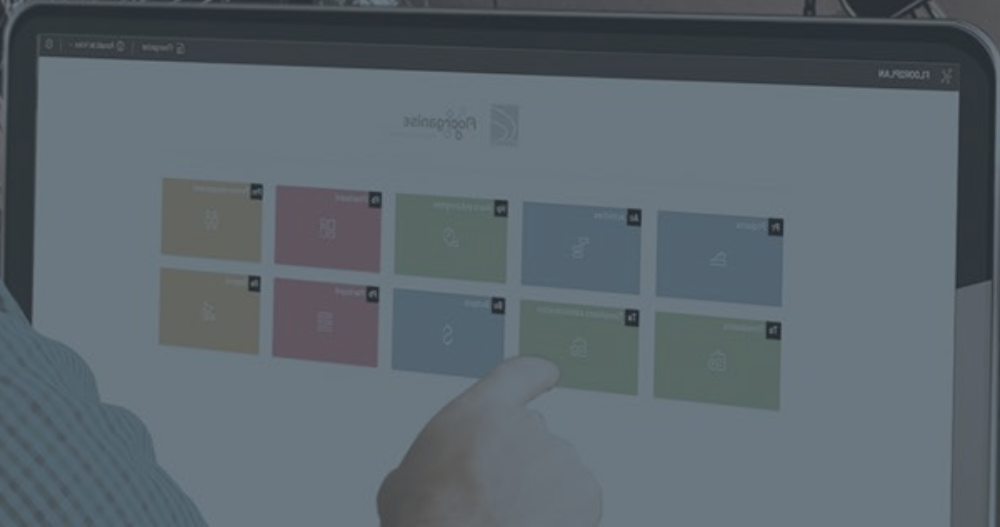
The screenshot displays the 'Configuration Shipbuilding PLM' interface in Floor2Plan. A red circle with the number '1' highlights the 'Shipbuilding PLM' connector in the left sidebar. Another red circle with the number '2' highlights the 'Synchronise' button in the top right corner of the main content area. Below the logo, there is an 'ADVANCED' section with a checkbox for 'Include images'. The 'SYNCHRONISATION HISTORY' table shows two successful import operations.

| | INITIATOR | START | FINISH | STATUS | MESSAGES |
|---|-----------------|--------------------|--------------------|----------|----------|
| ✓ | ShipbuildingPlm | 18/02/2024 5:13 AM | 18/02/2024 5:27 AM | Finished | |
| ✓ | ShipbuildingPlm | 18/02/2024 5:06 AM | 18/02/2024 5:07 AM | Finished | |

The team created a direct data exchange to import the engineering model from ShipbuildingPLM™

1. The connector has a dedicated page in Floor2Plan where users can view import results
2. The Synchronise button starts the import procedure and builds up the detailed planning of the project

Floor2Plan Templates



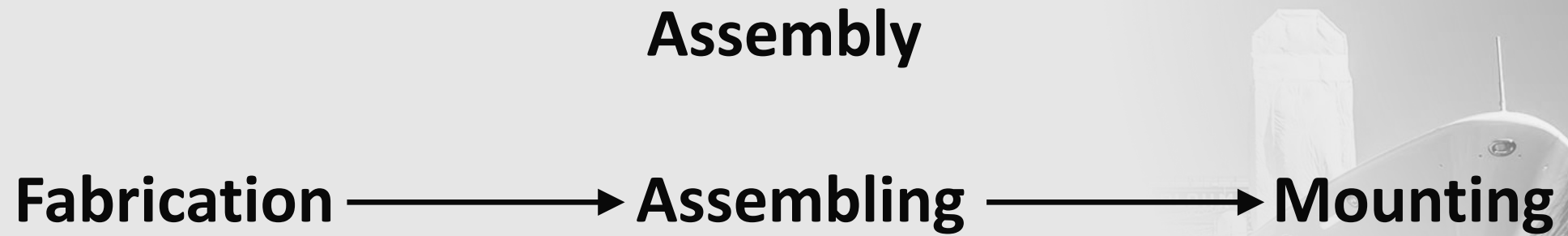
NSRP Phase 1 Workshop

What are templates?



- Floor2Plan templates are exactly what the name implies
- They consist of a standard value stream needed to build:
 - Units
 - Blocks
 - Assemblies
 - Systems
 - Plates
 - Spools
 - Etc.
- All template activities are sequenced with a set duration
- Each activity will consist of resource assignments that need to be completed
- Resource assignments are assigned to departments to oversee and disciplines for execution
- Templates also contain activity relationships, material requirements and more





NSRP Phase 1 Workshop

Mounting Assignments



Assembly



| Resource Assignment |
|------------------------|
| Department: Metal Shop |
| Discipline: Machinery |
| Budget: 8 hours |

| Resource Assignment 1 |
|------------------------|
| Department: Metal Shop |
| Discipline: Welding |
| Budget: 10 hours |

| Resource Assignment 2 |
|------------------------|
| Department: Metal Shop |
| Discipline: Grinding |
| Budget: 8 hours |

| Resource Assignment 1 |
|---------------------------|
| Department: Assembly Hall |
| Discipline: Welding |
| Budget: 8 hours |

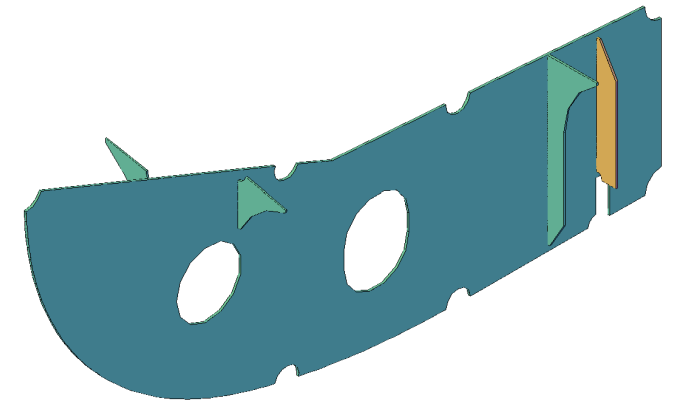
| Resource Assignment 2 |
|---------------------------|
| Department: Assembly Hall |
| Discipline: Grinding |
| Budget: 8 hours |

NSRP Phase 1 Workshop

Engineering model metadata



- From the metadata, we can use attributes like:
 - Weight
 - Surface Area
- Scale budgets and durations
- Making the detail planning less static and scale it based on the component's magnitude

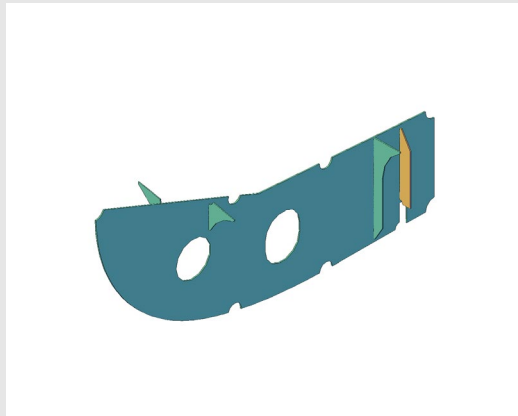


NSRP Phase 1 Workshop

Drawings + Templates = Detail planning

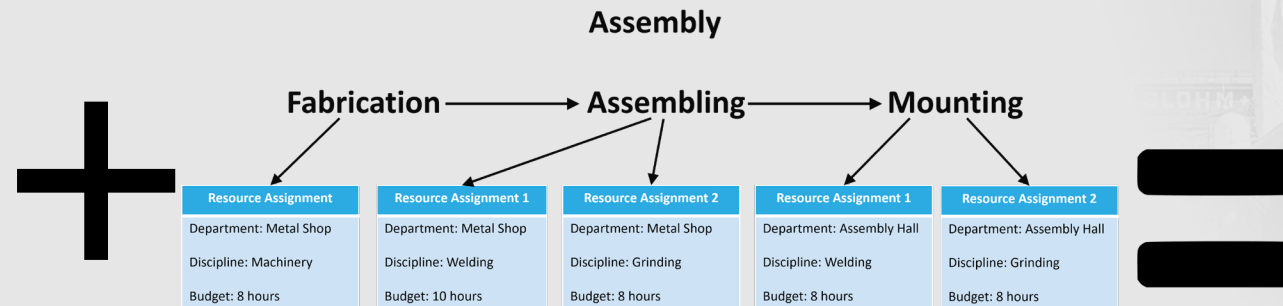


Engineering model



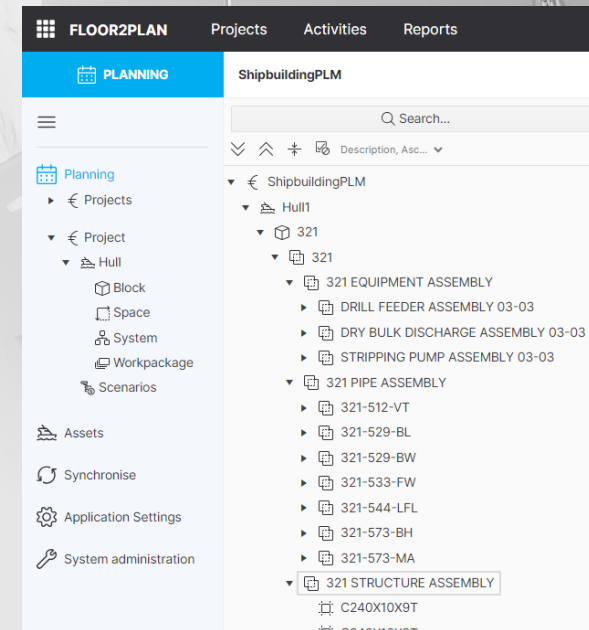
We use the metadata from the drawings as input into the templates.

Templates



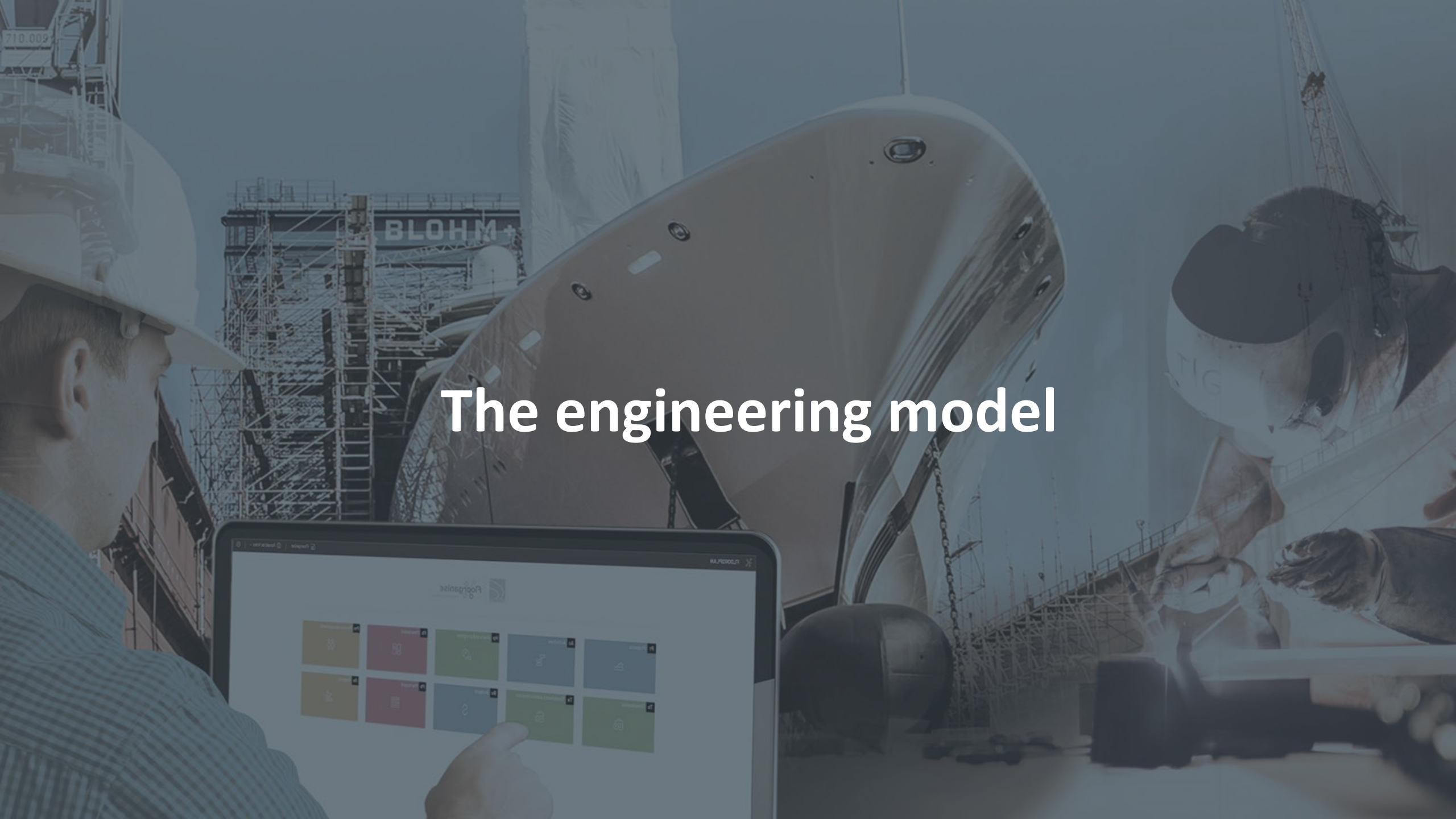
The system then turns the engineering model metadata into a detailed project plan.

Detail planning



More detailed project plans increase reporting capabilities and other functions

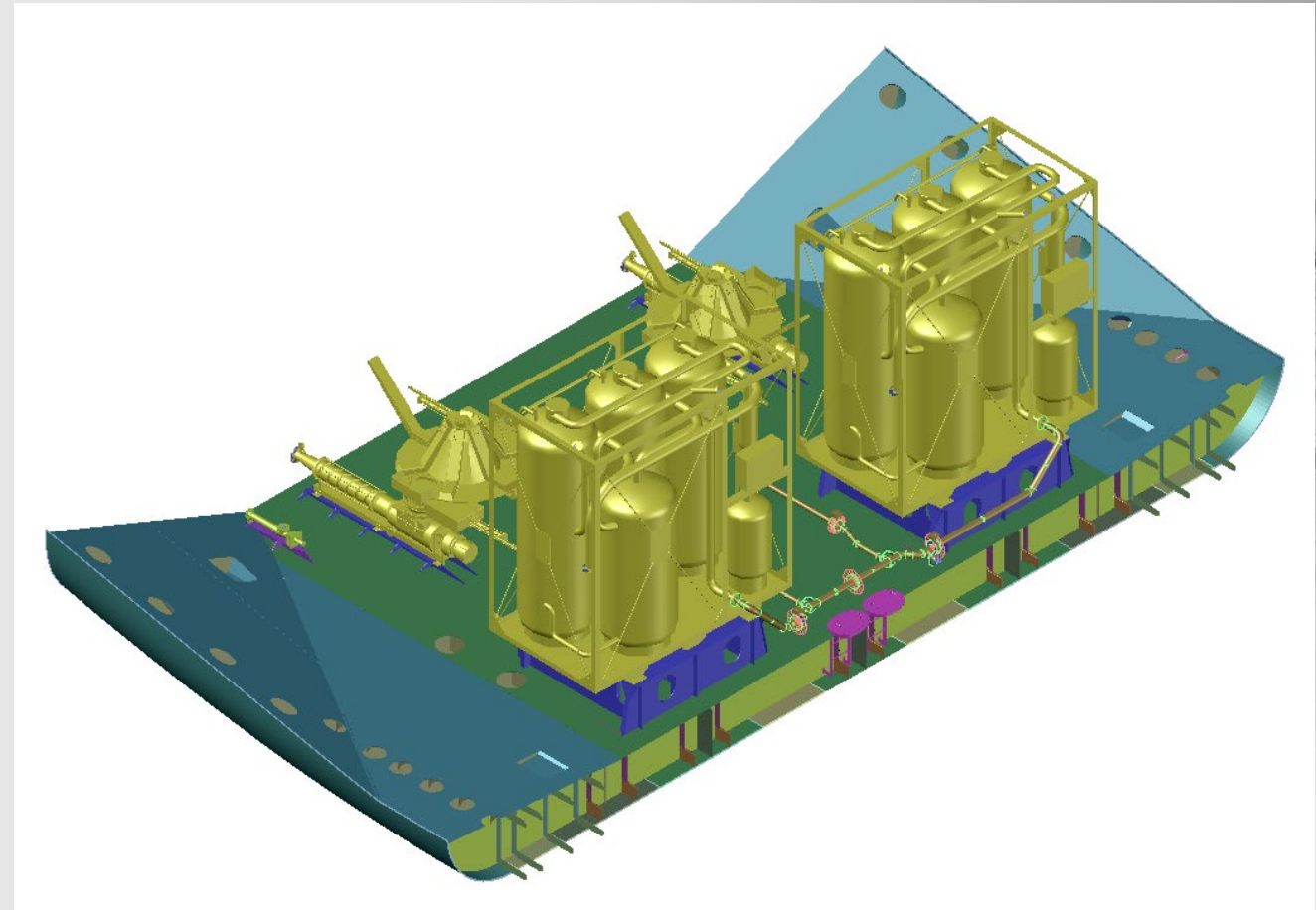
The engineering model





The example engineering data we used was block “321”

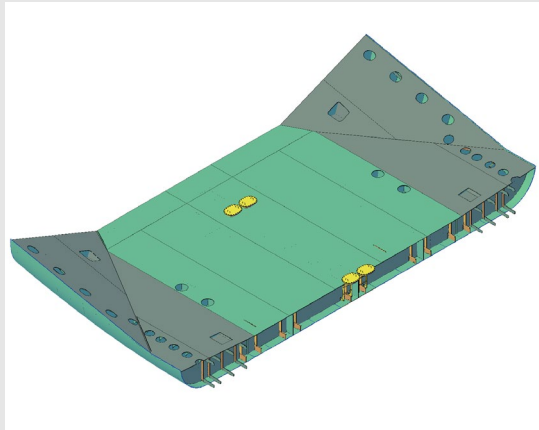
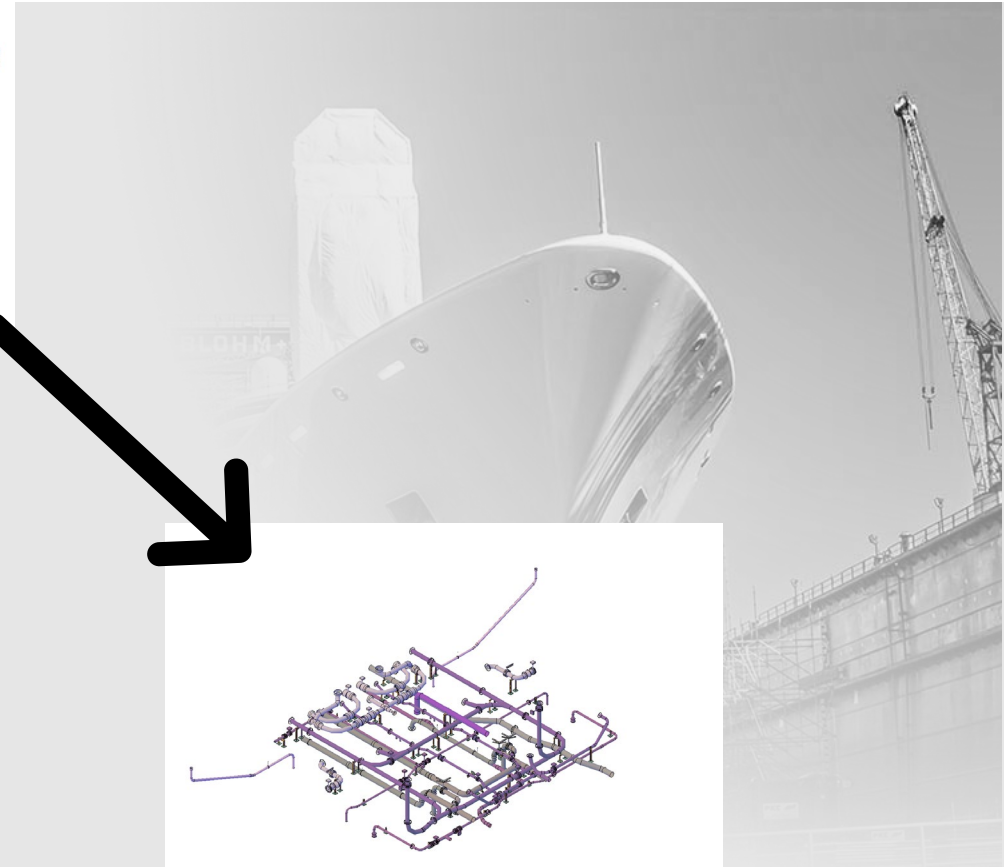
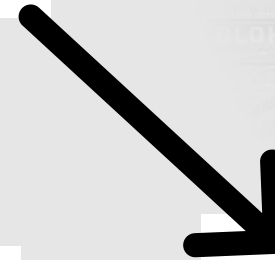
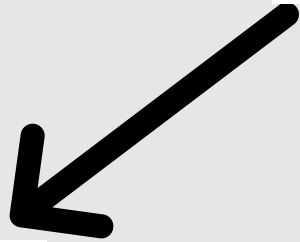
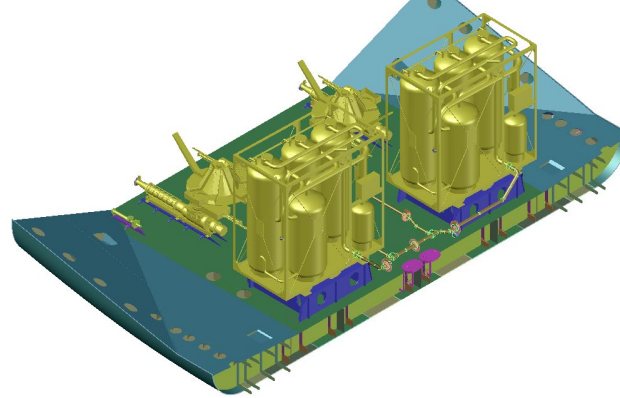
- Midbody block of a ship
- The engineering data had a hierarchy
- The drawings were grouped into:
 - Structures
 - Equipment
 - Pipes



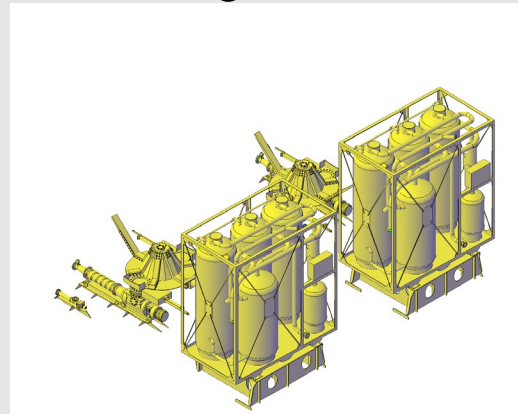
NSRP Phase 1 Workshop
The engineering model



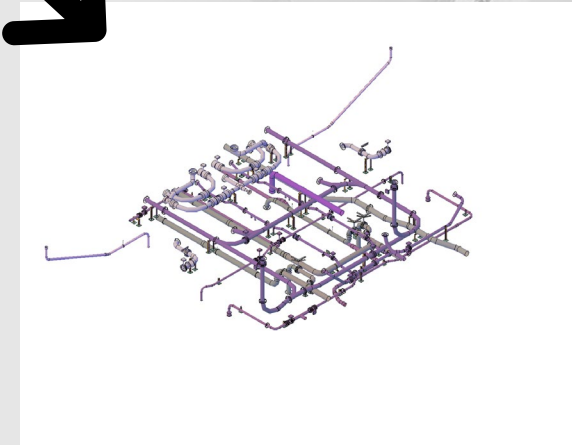
Block: 321



Structure Assembly

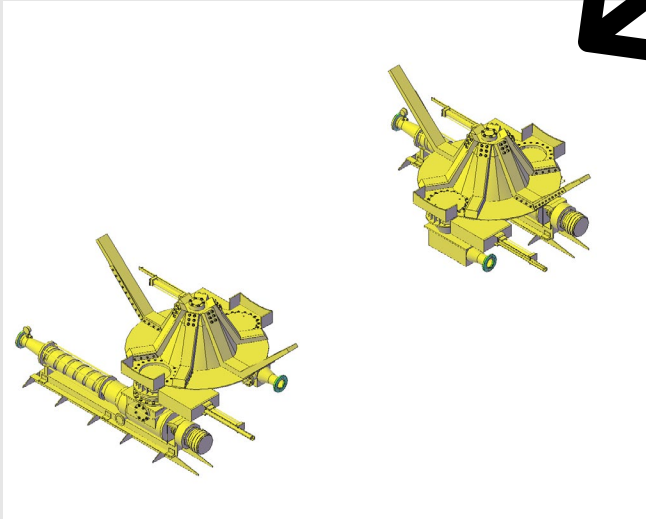
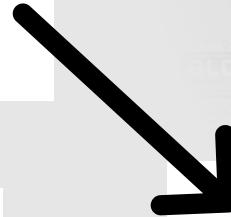
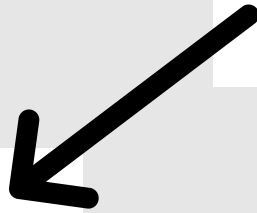
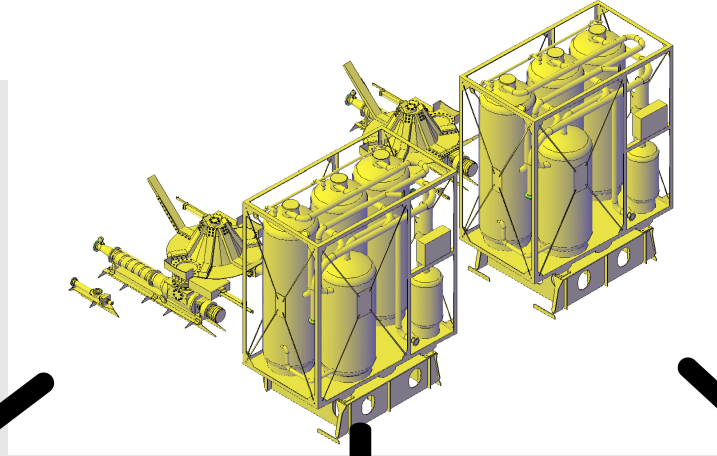


Equipment Assembly

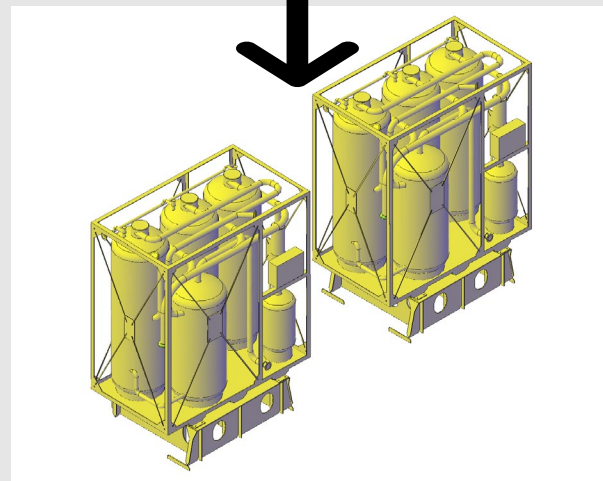


Pipe Assembly

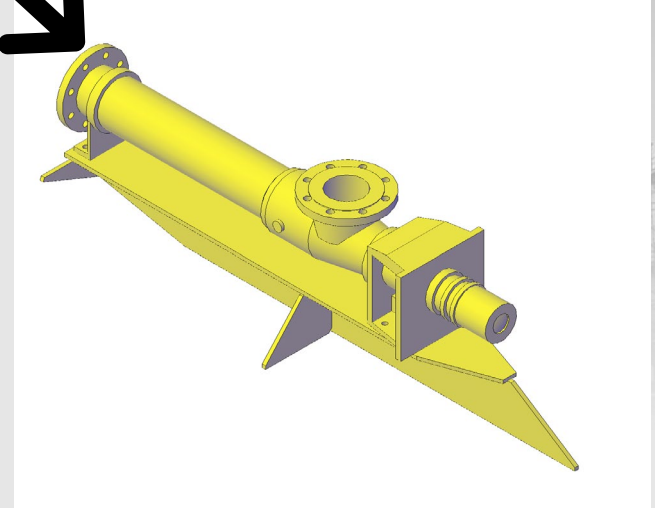
Equipment Assembly



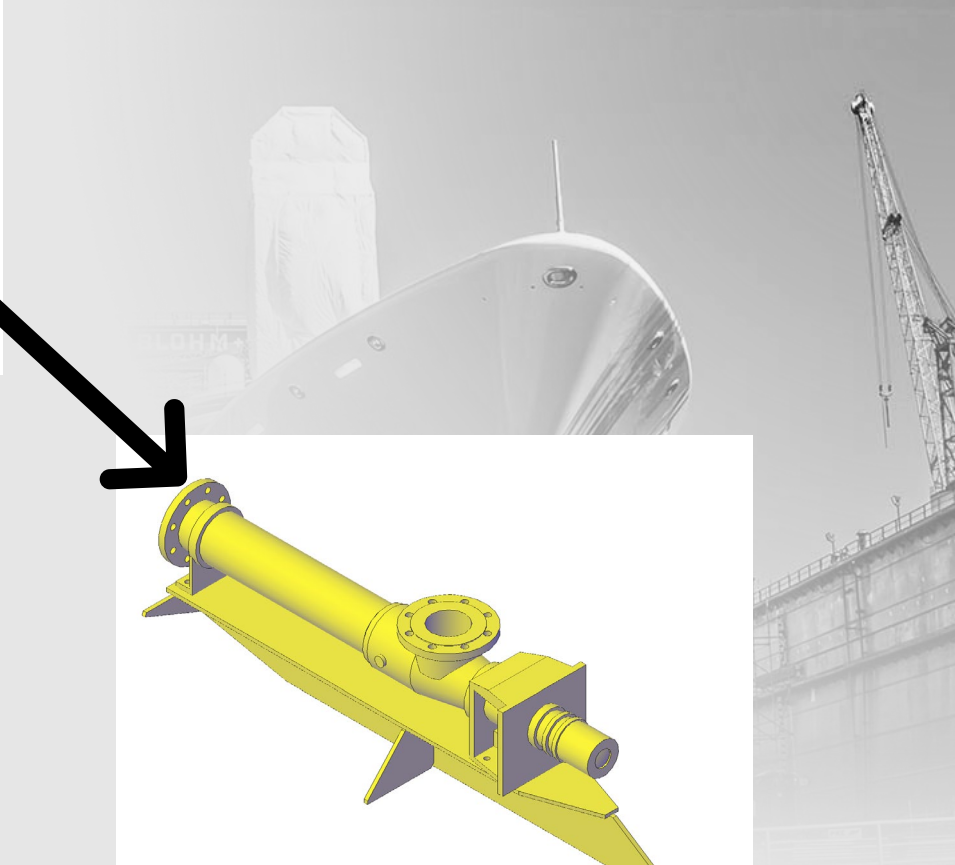
Drill feeder



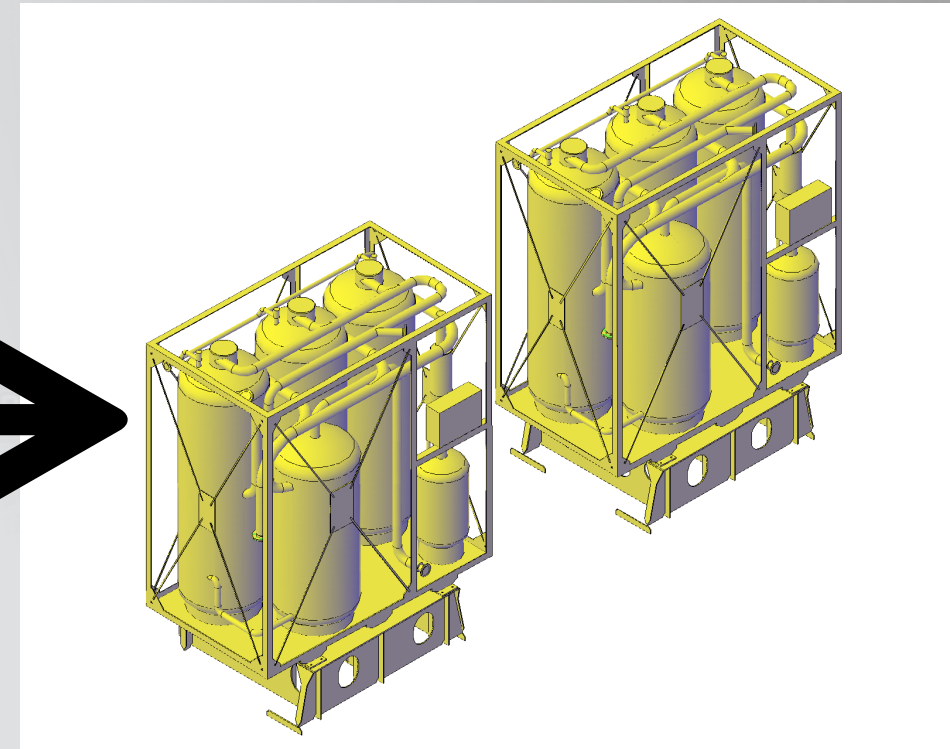
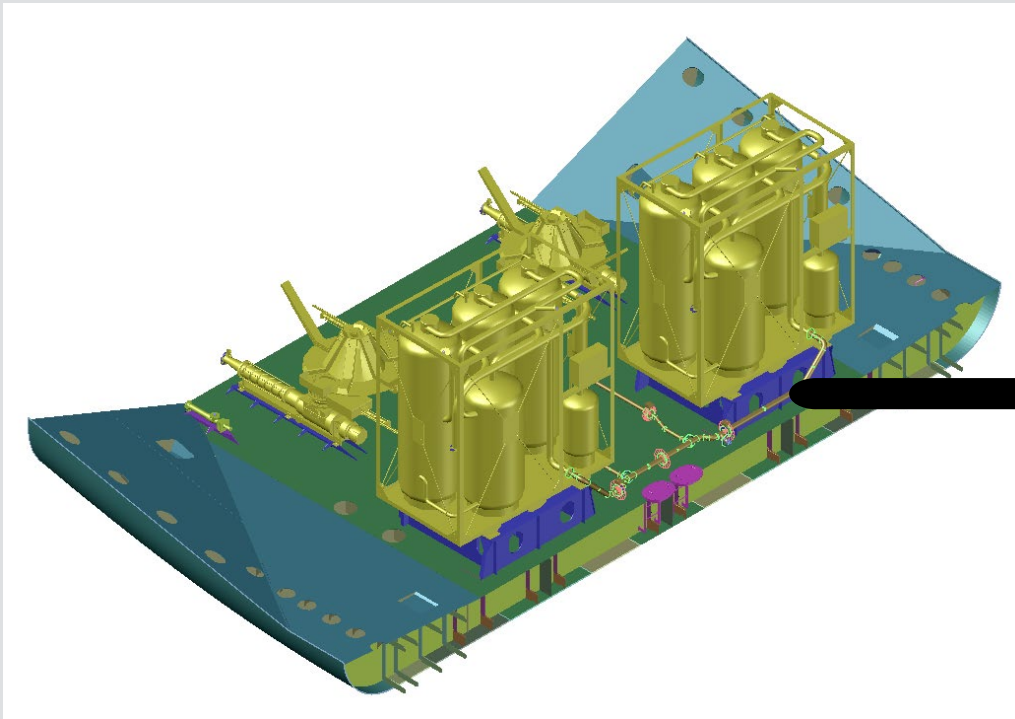
Dry Bulk Discharge



Stripping Pump

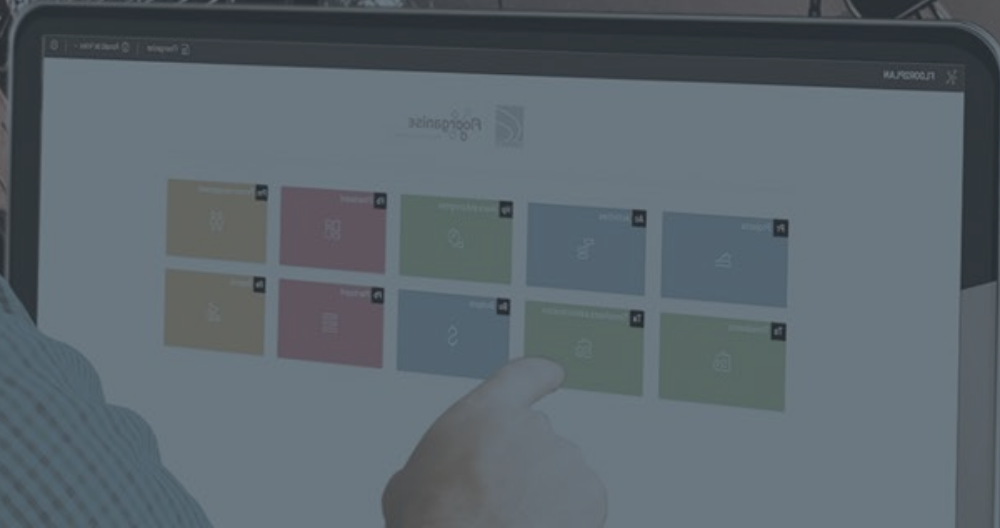


Topics



- Creating detailed planning from the metadata of the engineering model
- Results in a project plan with many activities
- To simplify we focused on the assembly for the “**Dry Bulk Discharge**”

Example of detail planning



NSRP Phase 1 Workshop

Benefits of a detailed project plan



Automating the creation of the project plans:

- Enables foreman progress in more detail
- Drawing names can become checklists
- More detailed material call-offs

The screenshot displays the FLOOR2PLAN software interface. The top navigation bar includes 'FLOOR2PLAN', 'Projects', 'Activities', and 'Reports'. The left sidebar is titled 'PLANNING' and contains a menu with options: 'Planning', 'Projects', 'Project', 'Hull' (with sub-items: Block, Space, System, Workpackage, Scenarios), 'Assets', 'Synchronise', 'Application Settings', and 'System administration'. The main content area is titled 'ShipbuildingPLM' and features a search bar and a list of project items. The list is organized hierarchically: 'ShipbuildingPLM' (€ icon) -> 'Hull1' (🏠 icon) -> '321' (📦 icon) -> '321' (📦 icon) -> '321 EQUIPMENT ASSEMBLY' (📦 icon) -> 'DRILL FEEDER ASSEMBLY 03-03' (▶ icon), 'DRY BULK DISCHARGE ASSEMBLY 03-03' (▶ icon), 'STRIPPING PUMP ASSEMBLY 03-03' (▶ icon) -> '321 PIPE ASSEMBLY' (📦 icon) -> '321-512-VT' (▶ icon), '321-529-BL' (▶ icon), '321-529-BW' (▶ icon), '321-533-FW' (▶ icon), '321-544-LFL' (▶ icon), '321-573-BH' (▶ icon), '321-573-MA' (▶ icon) -> '321 STRUCTURE ASSEMBLY' (📦 icon) -> 'C240X10X9T' (📦 icon).

**DELIVERING
OPERATIONAL
EXCELLENCE**

The Automatic detail planning



Model Drawings Production Drawings BOM **BOM Structure** Changes

3

| Part Name ↑ | Type | Revision | Generat... |
|---------------------------------|----------|----------|------------|
| 321 EQUIPMENT ASSEMBLY | Assembly | A | 1 |
| DRILL FEEDER ASSEMBLY 03-03 | Assembly | A | 1 |
| DRY BULK DISCHARGE ASSEMBLY ... | Assembly | A | 1 |
| STRIPPING PUMP ASSEMBLY 03-03 | Assembly | A | 1 |
| 321 PIPE ASSEMBLY | Assembly | A | 1 |
| 321-512-VT | Assembly | A | 1 |
| 321-529-BL | Assembly | A | 1 |
| 321-529-BW | Assembly | A | 1 |
| 321-533-FW | Assembly | A | 1 |
| 321-544-LFL | Assembly | A | 1 |
| 321-573-BH | Assembly | A | 1 |
| 321-573-MA | Assembly | A | 1 |
| 321 STRUCTURE ASSEMBLY | Assembly | A | 1 |
| C240X10X9T | Plate | A | 1 |
| C240X10X9T | Plate | A | 1 |
| C240X10X9T | Plate | A | 1 |



The drawing hierarchy from ShipbuildingPLM results in an automated detail plan in Floor2Plan

FLOOR2PLAN Projects Activities Reports

PLANNING ShipbuildingPLM

Search...

Description, Asc...

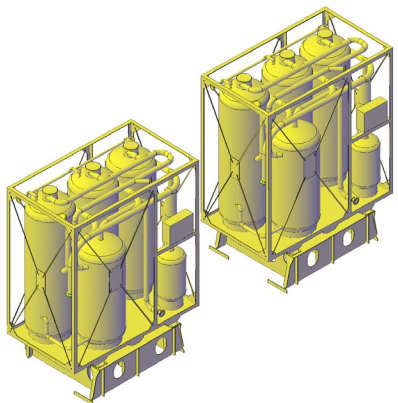
- € Projects
- € Project
 - Hull
 - 321
 - 321
 - 321 EQUIPMENT ASSEMBLY
 - DRILL FEEDER ASSEMBLY 03-03
 - DRY BULK DISCHARGE ASSEMBLY 03-03
 - STRIPPING PUMP ASSEMBLY 03-03
 - 321 PIPE ASSEMBLY
 - 321-512-VT
 - 321-529-BL
 - 321-529-BW
 - 321-533-FW
 - 321-544-LFL
 - 321-573-BH
 - 321-573-MA
 - 321 STRUCTURE ASSEMBLY
 - C240X10X9T
 - C240X10X9T
 - C240X10X9T

Assets Synchronise Application Settings System administration

Foundation planning

The plan for the dry bulk discharge assembly can be seen in the figure below.

1. The hierarchy gathered from the engineering model
2. Activities for building the foundation for the dry bulk discharge



The screenshot displays the Floorganise software interface. On the left, a tree view shows the project hierarchy:

- ^ Bollinger Shipyards
 - ^ Hull1
 - ^ 321
 - ^ 321
 - ^ 321 EQUIPMENT ASSEMBLY
 - ^ DRY BULK DISCHARGE ASSEMBLY 03-03
 - ^ DRY BULK DISCHARGE FOUNDATION 03-01
 - Pre Fabrication
 - Assembling
 - Mounting

A red box highlights the hierarchy from 'Bollinger Shipyards' down to 'DRY BULK DISCHARGE FOUNDATION 03-01'. A red circle with the number '1' is placed next to the '321 EQUIPMENT ASSEMBLY' level.

On the right, a Gantt chart shows a sequence of tasks represented by horizontal bars. A blue bar is followed by an orange bar, which is followed by another orange bar. Two 'Approve' buttons are positioned above the orange bars. A red circle with the number '2' is placed next to the second 'Approve' button. At the bottom right, there is a final 'Approve' button.

Project Status

- Phase 1 activities completed
- Phase 2 approval pending
- Phase 2 plans:
 - Stand up pilot environment at each shipyard
 - Execute pilot program at each shipyard with ship data of their choice
 - Report findings of pilot programs at an industry workshop
 - Prepare and submit the final report

