2023 NSRP All Panel Meeting

The Center for Naval Shipbuilding and Advanced Manufacturing presents the Navy ManTech Project

S2886 – Dynamic Rules Based Material Process

(A collaboration effort between ONR, NSAM, and Ingalls)

POP August 2020 – February 2023

Ron Wilson – Ingalls Shipbuilding
Scott Truitt – NSAM

For additional information contact: https://nsam.ati.org/contact/

INGALLS SHIPBUILDING
A Division of HII

NAVY MANTECH
Manufacturing Technology Program

Agenda

- Objectives
- Acknowledgements
- Background
- Benefits
- Technical Approach
- Results
- Project Status
- Issues

Objective

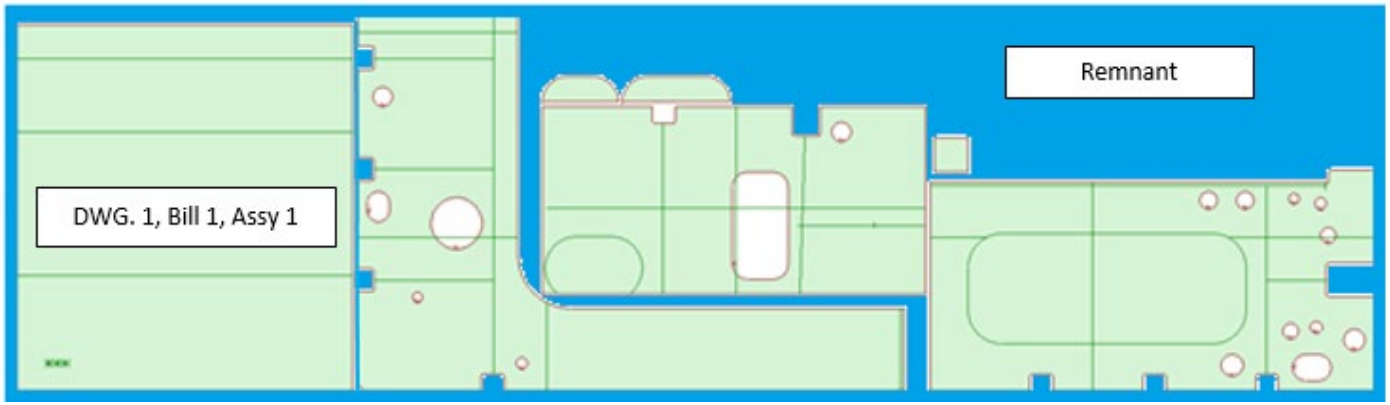
- **Analyze the engineering plate and pipe nesting processes, and develop an optimized rules-based process that enhances our ability to maximize material usage. Ingalls will evaluate dynamic nesting solutions with the goal of eliminating risk associated with cross nesting (across multiple bills, hulls, or contracts) while decreasing material handling cost and overall scrap. This is expected to add versatility to the process and minimize manual nesting, touch cost, and material waste. This will do the following:**
  - ↗ Eliminating risk associated with cross nesting (across multiple bills, hulls, or contracts) while decreasing material handling cost.
  - ↗ Create a rules-based process for effective consumption of whole material while reducing overall scrap.
  - ↗ Add versatility to the process and minimize manual nesting, touch cost, and material waste.
  - ↗ Address physical marking for material allocation (cost collection), tracking, and locating.

Acknowledgements

- **Project funding provided by the Office of Naval Research (ONR) Navy ManTech Program**
- **Navy ManTech program oversight provided by**
  - ↗ Paul Huang – ONR Program Officer
  - ↗ Scott Truitt– Center for Naval Shipbuilding and Advanced Manufacturing Project Manager
  - ↗ Lee Kvidhal – Project Technical Representative
- **Ingalls Shipbuilding**
  - ↗ Ron Wilson– Project Manager

Background

- The current manufacturing process for nesting plates (within Engineering), cutting plates (within the Fabrication Shop), and cutting pipe (within the Pipe Shop) result in excessive material waste.
- Additionally, the internal administrative constraints limit the ability to absorb the fluid nature of production (e.g., nesting that addresses just-in-time schedule requirements across contracts, hulls, units, material types/sizes).



Benefits

- Reduce Material Waste (Plate and Pipe), Including decrease Plate/Pipe storage footprint by 25%

- Reduction in manhours associated with Touch Labor, Material Handling, and Nesting Process by 10%

- Total 5 year savings on all hulls: $11.8M

Technical Approach

	Task Name
1	Dynamic Rules Based Material Process
2	Phase I - Process Analysis and Evaluation
3	Task 1 - Project Initiation
8	Task 2 - Baseline Current Processes
14	Task 3 - Define Future State and Assess Gaps
22	Task 4 - Define Requirements
29	Task 5 - Market Survey
38	Task 6 - Phase I Reporting
41	Phase II - Candidate Technology Development and Testin
42	Task 7 - Prototype Development
47	Task 8 - Pilot Technologies in Production Representative Environment
52	Task 9 - Implementation Plan and Final Reporting
57	Project Management

Technical Approach

- **The key objectives of Phase I were to**
  - ↗ Examine current baseline process and define the future state.
  - ↗ Market analysis on available nesting software vendors

SIGMANEST

SSI®

HGG

nestix

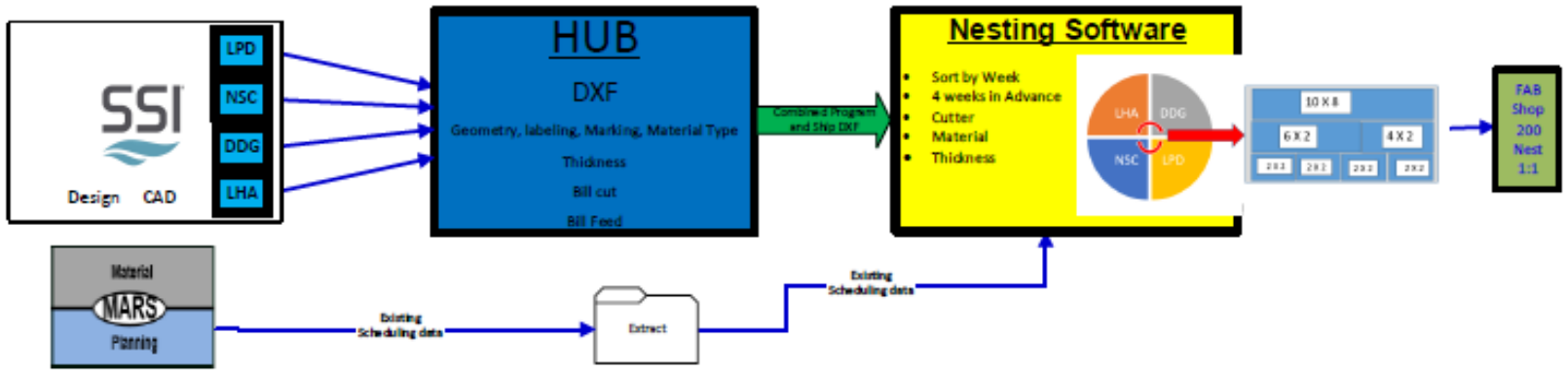
HEXAGON PPM

Columbus

Technical Approach

- **The key objectives of Phase II were to**
  - ↗ Development and Pilot Testing

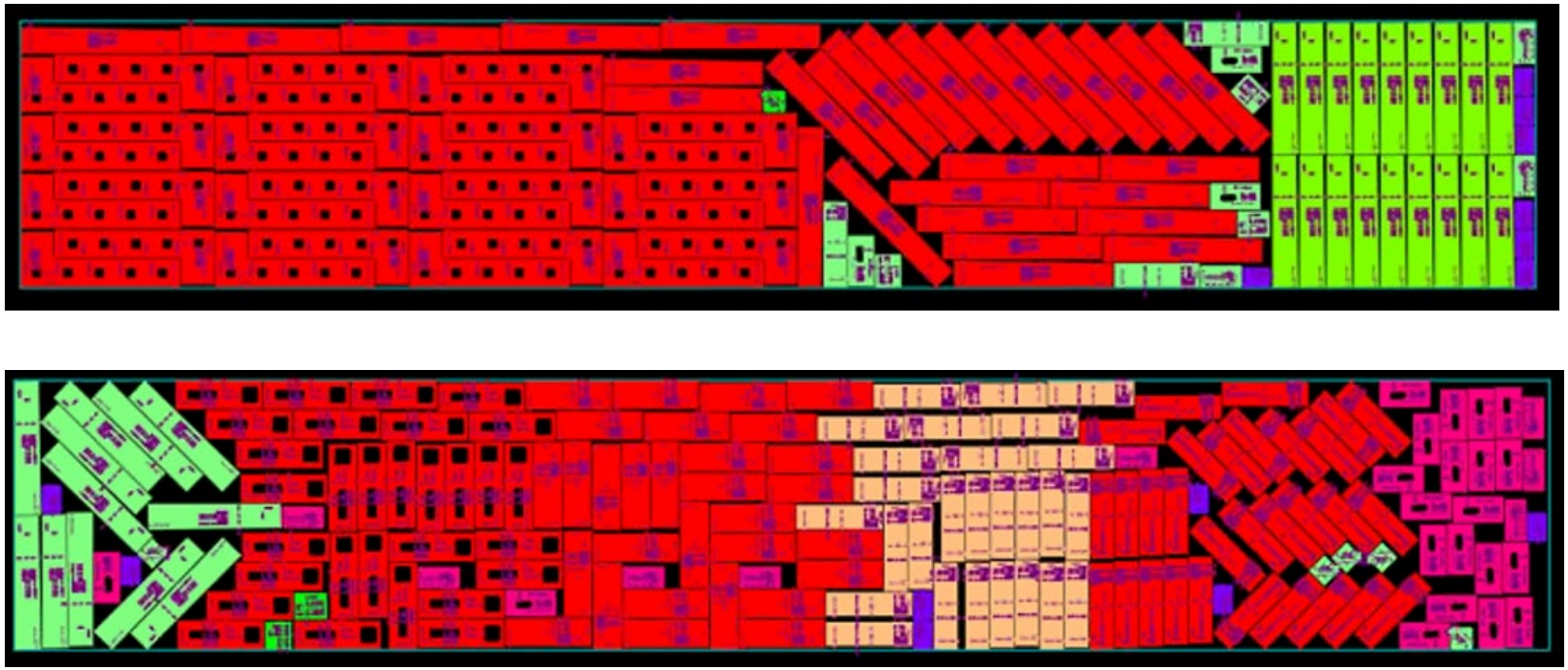
Plate Dynamic Rules Based Material Process



Pipe Dynamic Rules Based Material Process

Technical Approach

Each color represents a different program.

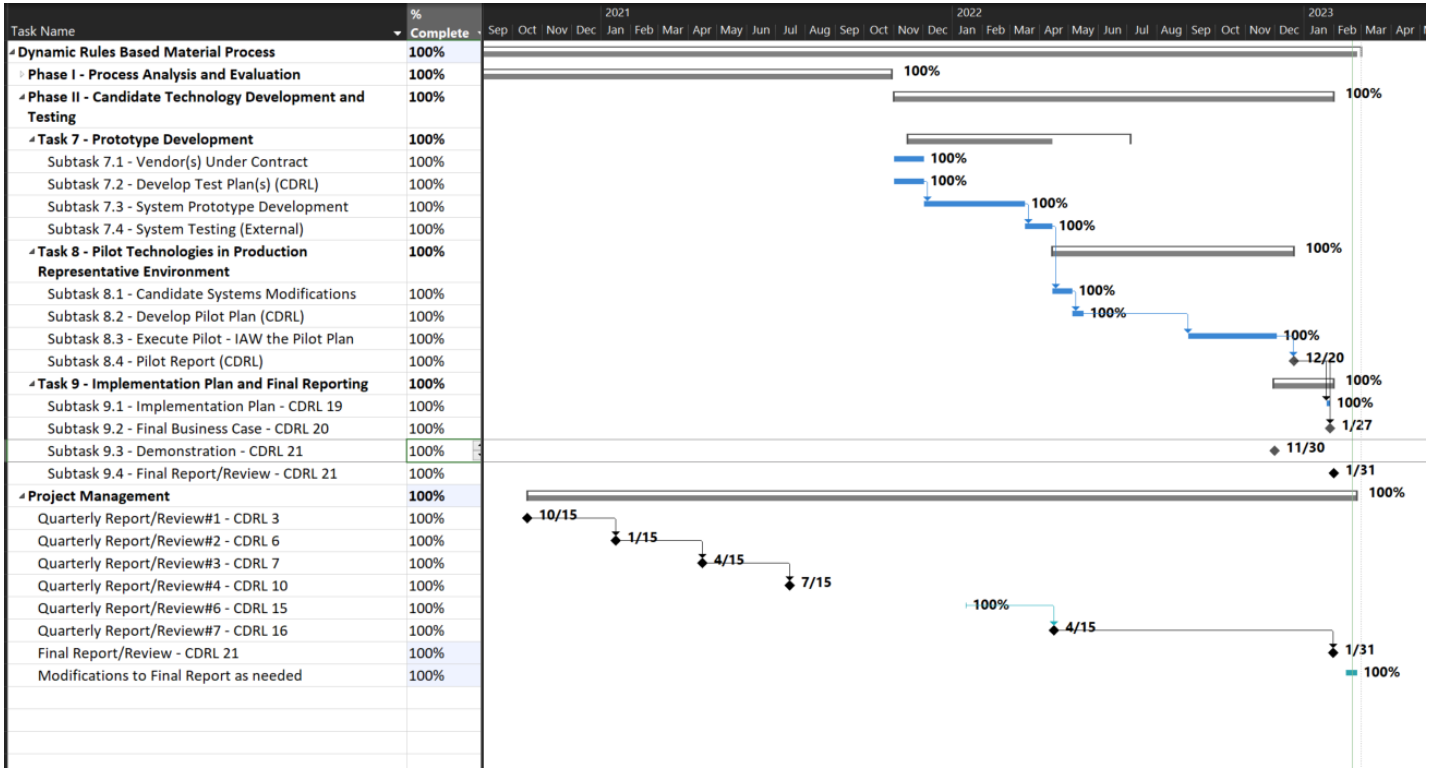


Results

- **Pipe**
  - ↗ The changes made to the DNC software by Praeses allows for work orders to be input in one-step, rather than manual uploads of each work order. The results from preliminary tests indicated an increased overall DRL size and reduced the overall percentage of drop generated. Testing was limited as Ingalls is transitioning from MARS to ORION.
- **Plate**
  - ↗ SigmaNest works as advertised and is a great product.
  - ↗ The team successfully ran a subset of legacy plates vs Sigmanest (multi-nesting)
    - Observed 23% total plate scrap reduction
      - 55% reduction in scrap rate

Project Status

- **The project is complete, as of 2/28/23, with all deliverables and milestones met.**



Task Name	% Complete
Dynamic Rules Based Material Process	**100%**
Phase I - Process Analysis and Evaluation	**100%**
Phase II - Candidate Technology Development and Testing	**100%**
Task 7 - Prototype Development	**100%**
Subtask 7.1 - Vendor(s) Under Contract	100%
Subtask 7.2 - Develop Test Plan(s) (CDRL)	100%
Subtask 7.3 - System Prototype Development	100%
Subtask 7.4 - System Testing (External)	100%
Task 8 - Pilot Technologies in Production Representative Environment	**100%**
Subtask 8.1 - Candidate Systems Modifications	100%
Subtask 8.2 - Develop Pilot Plan (CDRL)	100%
Subtask 8.3 - Execute Pilot - IAW the Pilot Plan	100%
Subtask 8.4 - Pilot Report (CDRL)	100%
Task 9 - Implementation Plan and Final Reporting	**100%**
Subtask 9.1 - Implementation Plan - CDRL 19	100%
Subtask 9.2 - Final Business Case - CDRL 20	100%
Subtask 9.3 - Demonstration - CDRL 21	100%
Subtask 9.4 - Final Report/Review - CDRL 21	100%
Project Management	**100%**
Quarterly Report/Review#1 - CDRL 3	100%
Quarterly Report/Review#2 - CDRL 6	100%
Quarterly Report/Review#3 - CDRL 7	100%
Quarterly Report/Review#4 - CDRL 10	100%
Quarterly Report/Review#6 - CDRL 15	100%
Quarterly Report/Review#7 - CDRL 16	100%
Final Report/Review - CDRL 21	100%
Modifications to Final Report as needed	100%

Project Status / Issues

- **Issues**
  - ↗ Ran out of time before performing in-depth analysis on larger sample sizes of plate
  - ↗ Testing complicated by company switching over from MARS to ORION.
- **Resolution**
  - ↗ The ORION project should be completed at Ingalls this year. The team will pursue capital funding to implement project solutions after ORION completes.

Project Goals / Objectives

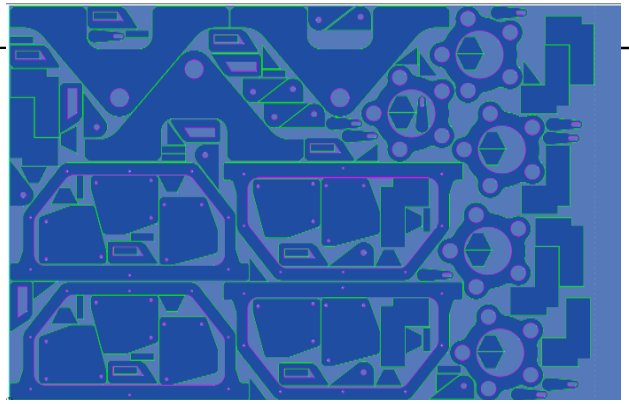
Objective: Reduce Material Waste (Plate and Pipe), Including Decreasing Plate/Pipe Storage Footprint								
Parameter	**Baseline Value**	**Requirement Threshold Value**	**Requirement Objective Value**	**How to Measure**	**Date to be Achieved**	**Achievement Value**	**Achievement Date**	**How Demonstrated**
Tonnage	Material Scrap	25%	35%	Weight as compared to legacy data	End of Task 8	55%	2/23/23	Comparison to baseline data
Objective: Reduction in Manhours Associated with Touch Labor, Material Handling, and Nesting Process								
Labor Hours	Labor for Current Activity	10%	20%	Conduct shipyard evaluations and document	End of Task 8	10%	2/23/23	Comparison to baseline value

Exit Criteria: Successfully Create Nesting File for Multiple Hulls					
Activity	**Requirement**	**Pass/Fail**	**How It Will Be Measured**	**Date to be Achieved**	**How Demonstrated**
Successfully Create Nesting File for Multiple Hulls	Software should be able to specify a nesting file for the most efficient use of plate and pipe, in a defined window of time and across multiple hulls as required.	Software operates properly to find most efficient method for plate and pipe nesting.	Assessment based on criteria defined in Pilot Plan	End of Task 8	Ran Legacy methods against SigmaNest for same dataset.

Exit Criteria: Engineering (ShipConstructor) Outputs					
Activity	**Requirement**	**Pass/Fail**	**How It Will Be Measured**	**Date to be Achieved**	**How Demonstrated**
Execute Successful Pilot at Ingalls	Create plate and pipe nest data direct from the model using rules-based process (i.e., what's scheduled, maximizing material usage), across projects, bills, hulls, contracts.	Management approves for implementation.	Assessment based on criteria defined in Pilot Plan	End of Task 8	Ran Legacy methods against SigmaNest for same dataset.

Questions?

Future state optimizing plate usage with dynamic nesting and piece part marking



Enhance ability to create a rules-based process for effective consumption of whole material while reducing overall scrap.

Project Number: S2886

Title: Dynamic Rules Based Material Process

Performing Activity: Naval Shipbuilding and Advanced Manufacturing Center (NSAM)

Objectives: Analyze the engineering plate and pipe nesting process, and develop an optimized rules-based process that enhances our ability to maximize material usage.

Start / End Dates: Aug 20 – Feb 23

Project Cost: ManTech Investment: $1.68M

Weapon System: DDG-51

Performing Entities:

- Navy ManTech – Program Oversight
- NSAM – Project Management / Technical Oversight
- PMS 400 - Project Oversight
- HII-Ingalls – Project Lead; Facility Support

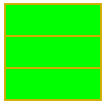
Technical Achievements:

Nov 20 Baseline Process Report
Feb 21 Future State Process Map
Mar 21 Gap Analysis
Jun 21 Requirements Report
Nov 21 Market Survey Report
Dec 21 Test Plan
Jun 22 Pilot Plan
Jan 23 Pilot Report
Feb 23 Implementation Plan and Final BCA
Feb 23 Final Report/Review with Demonstration

Implementation:

System: DDG-51
Site: Huntington Ingalls Industries, Inc. (HII-Ingalls)
Schedule: Oct 22; DDG 137, LHA 9, LPD 33, and NSC 12
Status: Implementation anticipated 1Q FY24

Cost
Schedule
Technical



Payoff:

- $2.54M per hull (DDG)
- $1.45M per hull (LHA)
- $1.93M per hull (LPD)
- $0.01M per hull (NSC)
- 5 Year Savings: $20,572,706 (All Hulls)
- Ingalls 5 Year ROI = 8.4
- DDG 5 Year ROI = 4.7

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Project Team

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Robert Mashburn – Deputy Director
Scott Truitt – Project Manager
Lee Kvidahl – Project Technical Representative

David Clark – PMS 400D

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