Knowledge Provisioning to Improve First Time Quality of Ship Design

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Agenda

• Overview of Shipping, Ship Design and Shipbuilding
• Overview of National Shipbuilding Research Program
• Overview of NSRP Project Team Members
• Overview of NSRP Project
Shipping, Ship Design and Shipbuilding
Global Industry

- 90% of U.S. imports/exports carried by ships
  - Tankers
  - Containerships
  - Bulk Carriers
  - Roll-on/Roll-off
- U.S. Navy - 400+ fleet (active service and reserve); 270+ battle force
  - Combat fleet (Carriers, Subs, Cruisers, Destroyers, Frigates, Amphibs)
  - Auxiliaries (Oilers, Ammunition/Stores Carriers)
  - Misc. others (Survey/Oceanographic, Mine C/M, Patrol)
- Ferries (passenger/vehicle), Cruiseships
- Research Vessels, Fishing Vessels, Tugs, Dredges.
Ship’s I’ve worked on...
Marine Industry Reach

- Ship Designers
- Ship Builders/Repairers
- Ship Owners
- Ship Operators
- Ship Management

- Port Authority/Terminal
- Navy/Coast Guard/Govt
- Regulatory
- Insurance
- Marine Finance/Law
- Manufacture/Supplier/Distributor
National Shipbuilding Research Program
NSRP Mission

• Manage and focus national shipbuilding and ship repair research & development funding on technologies and processes that will:
  • Reduce the total ownership cost of ships for the U.S. Navy, other national security customers and the commercial sector
  • Develop and leverage best commercial and naval practices to improve the efficiency of the U.S. shipbuilding and ship repair industry
  • Provide a collaborative framework to improve shipbuilding-related technical and business processes
NSRP Collaboration

NSRP Sponsors
- NavSea Systems Command
- PEO Carriers
- PEO IWS
- PEO LCS
- PEO Ships
- PEO Subs
- U.S. Coast Guard

Graphic is missing Conrad Shipyard, latest member
**NSRP Program Focus**

**Technology Transfer Industry Networking**
- Panel Meetings
- Industry Conferences
- Project Demonstrations

**R&D Projects**
- Project Solicitations
- Project Management and Execution

**Ad Hoc Initiatives**
- Specific target areas
- Quickly established to include key stakeholders
- Disbanded when required actions are completed

Primary channel for dissemination of project results

Majority of Program $
# Major Initiative Teams

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<th>Ship Design &amp; Material Technologies</th>
<th>Ship Production Technologies</th>
<th>Business Processes &amp; Information Technologies</th>
<th>Infrastructure &amp; Support</th>
<th>MITL-at-large</th>
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<td>Lead: David Rice (NNS)</td>
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<td>Steve Cogswell (BAE Systems – SE Shipyards)</td>
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NSRP Project Team Members
Project Team

- Shipyards

- Technology Providers

Hepinstall Consulting Group, Inc.

V. Dlugokecki, P.E.
Conrad Shipyard

- Established in 1948
- Five shipyards in Morgan City / Amelia, LA
- Wide range of 1000+ vessels built for commercial customers and the US Government:
  - Inland and Offshore Tank / Freight / Deck Barges; Specialty Barges
  - Tugs and Pushboats
  - Ferries
  - Offshore Support Vessels (Liftboats, Offshore Service Vessels, Crew Boats, Fire Boats)
  - LNG Bunker Barges
General Dynamics – Bath Iron Works

• Shipbuilding has been a way of life in Bath, ME
  • Bath Iron Works Foundry est. 1826
  • Shipyard est. 1884
  • Hull #1 (Cottage City, passenger steamer): 1890
  • General Dynamics: 1995

• More than 425 ships, including 245 military (destroyers and frigates), and over 160 private yachts and commercial vessels.
Fincantieri Marinette Marine

• Established in 1942 along the Menominee River, Marinette, WI.
• Fincantieri: 2009
• Designed and built more than 1,500 vessels for military and commercial customers.
General Dynamics - NASSCO

- Established 1960
- New construction (1) and repair (3) yards.
- Largest full service shipyard on the West Coast of the US
- Builds commercial cargo ships and tankers (53), and Navy auxiliary ships (70):
  - Tankers, Containerships, Trailerships (Ro-Ro), Con/Ro
  - Expeditionary Sea Base / Transfer Dock, T-AKE, T-AO (fleet oilers)
Bollinger Shipyard

- Established 1946
- Ten shipyards throughout southern LA.
- Marine construction, boat repair and conversions, and services to both the US Military and commercial marine industry.
Ship Constructor (SSI)

- Autodesk ® based Shipbuilding and Offshore Software
- Created for design, engineering and construction in the shipbuilding industry
- 100s of North American users; 100s of more users in Europe, East / Southeast Asia, Latin/South America, Australia/Oceania;
- Used for both commercial and naval projects; small design shops to large enterprise clients.
American Bureau of Shipping

- Established 1862
- Classification Society:
  - More than 50 worldwide
  - 12 are members of IACS (International Association of Classification Societies) – more than 90% of the world’s cargo-carrying ships tonnage are covered by IACS members’ standards.
  - Largest are ABS, DNV GL, ClassNK, and Lloyd’s Register, RINA, BV
- Marine classification:
  - Promotes safety of life, property and the environment through the establishment and verification of compliance with technical and engineering standards for the design, construction and life-cycle maintenance of ships, offshore units and other marine-related facilities.
  - Standards are contained in rules established by each Society.
Project Facilitators

- Hepinstall Consulting Group
  - Serving the shipbuilding and repair industry since 2005.
  - Lisa Hepinstall, President: brings almost 30 years of business and transformational management experience to the project team.

- Victoria Dlugokecki, P.E.
  - Consultant since 2003.
  - Brings almost 30 years of experience in ship design and construction; employment background includes shipyards, design offices and class society.

Lisa and Vicky have worked numerous NSRP projects and other projects together.
NSRP Project
Overall Problem Statement

We are losing our technical “Know-How” in U.S. Shipbuilding and Ship Repair

FMI 2014 Shipbuilding & Repair Benchmark Study
• The trend toward increasingly complex vessels was also identified in FMI’s findings for the GSIIBBS and there is no indication that this is reducing.
• Need for a rationalized standard design approach that includes new methods and reduces design cost.

CNO Strategic Plan, 2016
• Apply the best concepts, techniques and technologies to accelerate learning as individuals, teams and organizations.
• Do not relearn old lessons.
• During execution, conduct routine and rigorous self-assessment.
Complexity in Shipbuilding

- Cost
- Complexity
- Regulations and Requirements
- Workforce Attrition
- Balancing Disciplines
Objective

Automate the *provisioning of information* at each step of the ship design process as the engineer progresses through the flow of work.
Approach

• **Convert**
  • Shipyard / Industry technical memory into K-PACS

• **Connect**
  • ShipConstructor ↔ Auros

• **Integrate**
  • Knowledge Delivery System
Key Project Technical Tasks

- Perform Shipyard Readiness Activities
- Develop Shipyard-Specific Pilot Fundamentals
- Develop Connector between AUROS and Ship Constructor
- Develop and Import Shipyard Data Requirements, Rules, and Best Practices
- Create Shipyard Dashboards
- Test and Evaluate Functionality of each Knowledge Packet
- Implement Shipyard Pilot
- Measure Effectiveness of Shipyard Pilots
Pilot Focus Areas

- Shipyard Specific
  - Facility Capabilities
  - Structural Functional / Detail Design
  - Piping Functional / Detail Design
  - Penetration Location Validation
Pilot Focus Areas

• Industry Collaborative “Starter Kit”
  • NSRP Guidelines (Penetrations, Design for Production, Design for Maintainability, Distortion Control)
  • Industry Standards (ABS Rules, Ergonomic Guidelines)
  • SNAME T&R Bulletins (Lean Design)
Ultimate Project Goals

- Reduce non value-added time
- Improve first time quality
- Simplify design review
- Provide knowledge exchange
- Reinforce standard processes
- Measure usage and compliance
QUESTIONS?