

Production Engineering

Detailed Design Solutions



*Beautiful Designs.
Efficient to Build.
Extraordinary to Operate.*

Jensen Maritime Consultants

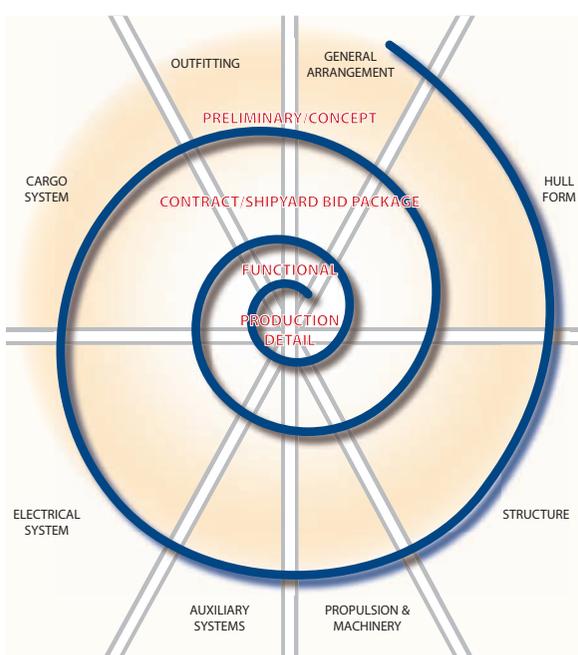
See it before you build it. Let Jensen design your next vessel with ShipConstructor software and see it in 3D before it is ever built.

Production Engineering Basics

Production Engineering takes functional design to the next level by incorporating design information into a full-size 3D model. Our team combines all the details of the structural, electrical, mechanical and HVAC systems of the vessel into one comprehensive model of your project. The result is a virtual vessel that can be inspected early in the design process for safety, maintainability and constructability. Additionally, by previewing the vessel in 3D, project stakeholders have the unique opportunity to confirm the vessel's layout, maintenance envelopes and operational access. These models can also be easily shared with others at no cost through the NavisWorks software, which enables view-only access to the entire model, without any special hardware requirements.

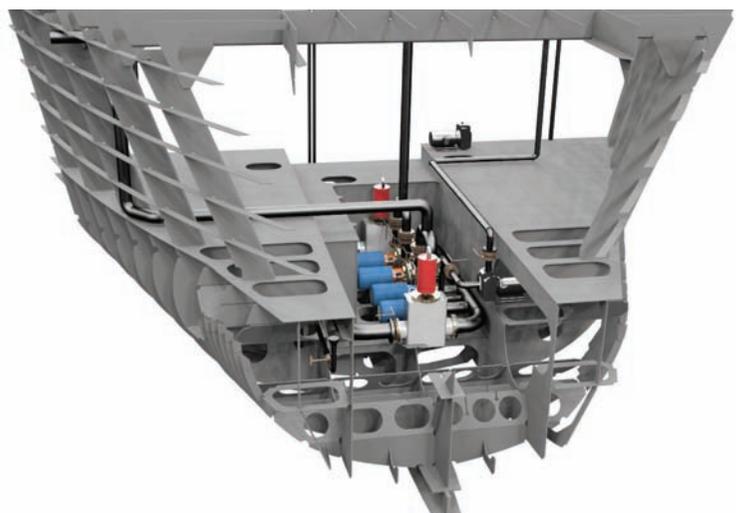
Technical Delivery

Our technical deliverables are divided into two categories: nest and Assembly & Detail (A&D) drawings. Sent electronically to plate cutters, the nest drawings act as the blue prints for cutting vessel components directly from raw



Product Offerings:

- **Structural Lofting**
- **Plate Nesting**
- **Assembly Drawings**
- **Pipe Routing**
- **Arrangement and Details**
- **Isometric Pipe Spooling**
- **HVAC Routing**
- **Wireway Routing**
- **System Integration**
- **Maintenance Review**
- **Operational Review**
- **On-site Engineering & Modeling Support**
- **3D Design Review**
- **Equipment Modeling**
- **Interference Detection**
- **Material Reports**
- **Weight Estimates**
- **Center of Gravity Estimate**
- **Lifting and Turning Analysis**

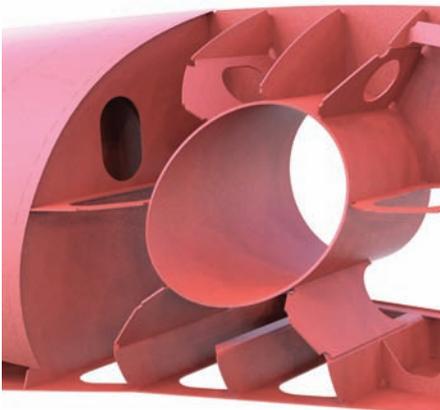




materials. The structural A&Ds, often considered the roadmaps for builders, show where and how each piece fits together. Jensen also can provide a third type, mechanical system Arrangement & Detail drawings, that guide the builder to prefab (spool) the piping for installation (pre-outfitted) in vessels, based on the modular construction strategy. We can also provide A&Ds for cable trays and HVAC duct work, specific to shipyard preference or unique construction requirements.

Experience

The Jensen team excels over the competition by bringing more than 150 years of combined shipyard experience and operational knowledge to its design team. Because our team has expertise in building vessels, we truly understand what it takes to design a vessel that meets client requirements, while ensuring that it's efficient to build. We won't leave any stone unturned when analyzing our design for build-ability and functionality. And because our parent company, Crowley Maritime, currently maintains and operates more than 200 vessels, we gain valuable insight into vessel operations. The working relationships we've gained with shipyards and vessel operators allow us to continually design vessels that exceed customer expectations.



Advantages of Using Production Engineering Services

Rapid Design Development

Our team brings together functional and production design experts, who can work concurrently on the same design. Our processes allow for a faster design phase eliminating the need for one portion of the project to be completed before moving on to the next.

Customized Shipyard Packages

Jensen will work with you to customize an engineering package that maximizes use of your construction resources, based on handling sizes and/or crane capacities in your facilities. We plan the project by dividing it into modular units that can greatly reduce the time frame, as well as the hours per ton required to build and outfit a project. Our optional on-site services can utilize the ShipConstructor model to coordinate the routing of small-bore systems, saving precious time that was once allocated for field routing.

Improve Construction Timeline

Jensen's methods for production engineering allow for increased yard/shop through-put thanks to our use of modular construction. Modular construction enables multiple-site construction, reducing demand at busy launch sites and improving your project's overall time frame.

Supply Chain Management

Our engineering package can deliver customized BOMs (Bill of Material), maximizing your purchasing power and timing of material deliveries.

Reduced Carbon Footprint

Reduce your carbon footprint with shorter build times, less waste and minimized rework.

JENSEN NAVAL ARCHITECTS AND MARINE ENGINEERS:

- Naval Architecture
- Hydrodynamics
- Hydrostatics
- Structural Engineering
- Systems Engineering
- Electrical Engineering
- Production Engineering
- Construction Management
- Sealift/Heavy-lift Engineering
- Salvage Engineering
- On-site Engineering assistance
- Project Management
- Marine Casualty Response

FULL SERVICE, FROM PRELIMINARY CONCEPT TO VESSEL DELIVERY:

- Preliminary/Concept Design
- Contract Design
- Functional Design
- Production Design
- Construction Management
- Refurb / Re-power
- Retrofit / As-built

OTHER SUPPORT SERVICES:

- Specification Development and Writing
- Contract Negotiation
- Shipyard Selection
- Price Negotiation
- Technical Integration
- Change Order Management

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