

SOLUTION

SMARTMARINE[®] ENTERPRISE

Improving the Complete
Marine Structure Life Cycle

INTERGRAPH[®]







INDUSTRY FORECASTS

The marine industry is changing quickly. Industry leaders agree on a number of factors they predict will be driving their businesses in the near term. These forecasts can be separated into three essential areas – design, production, and sales activities.

Design Forecasts

- All materials, components, and “number of pieces” will be defined for structure and outfitting.
- All arrangements, connections, and block divisions will be defined early in design.
- A complete 3D solid digital product model is the result of the design process and will be seen as the only valid result.
- Designs will be rule-driven to ensure quality and cost reductions in production – including rules that drive the automatic generation of drawings.
- All outfitting will be modularized, and all modules will be placed in blocks before moving to the building dock.

Production Forecasts

- Today's specialized production lines (halls) will be replaced by multi-functional individual (block-oriented) workshops.
- Throughout the next 10 years, total production time for a large marine structure will be reduced from nine months to six months.
- Automation will continue to grow, but is unlikely to reach a significant level.
- Logistics for materials distribution will be dramatically improved based on similar improvements in planning and follow-up.
- Accuracy will be much improved, and that will significantly reduce the labor hours needed.

After-Sales Support Forecasts

- The digital 3D product model is installed onboard, at the owner, and at class.
- 3D product model-based communication will ease maintenance, increase safety, improve service rates, and facilitate crew training.

INTERGRAPH[®], THE MARINE LEADER

Intergraph is a world leader in marine structure design and data management. The world's leading global classification societies – American Bureau of Shipping, Det Norske Veritas, and Lloyd's Register – not only endorse Intergraph's technology, but also are using it in their own businesses to regulate standards and practices. Intergraph's major marine customers in the list that follows include two of the top five global shipyards:

- American Bureau of Shipping (ABS)
- Aker Yards (formerly Chantiers de l'Atlantique)
- COSCO Shipyard Group
- Daewoo Shipbuilding & Marine Engineering
- DCNS
- Det Norske Veritas (DNV)
- GHESA

- Grenland Group
- Keppel FELS
- Lloyd's Register (LR)
- MARIC
- Martec
- Maua Jurong
- Navantia
- Northrop Grumman
- Odense Steel Shipyard
- Projemar
- QUIP Consortium
- Rosetti Marino
- RUBIN
- Saipem
- Samsung Heavy Industries
- Six Tee Engineering Groups
- Technip Offshore
- Tsuneishi Shipbuilding
- UAB Baltic Engineering Centre (BEC)
- Universal Shipbuilding (formerly Hitachi)
- U.S. Navy

SMARTMARINE[®] ENTERPRISE

The most advanced marine structure design solution available in the market today, the SmartMarine Enterprise suite is Intergraph's next-generation, data-centric, rule-driven solution for streamlining design processes while preserving existing data and making it more usable and reusable.

SmartMarine Enterprise provides a full range of flexible design, fabrication, assembly, and life-cycle management capabilities within a single integrated environment. It provides marine and engineering companies with better decision-support capabilities to facilitate global design, construction, and life-cycle optimization – ultimately making contractors and yards more competitive.

Engineering rules built within the software ensure design accuracy and consistency. This allows the designer to focus on the task at hand rather than how to operate the technology. It reduces design errors, changes, and rework. Enforcement of the design rules results in increased productivity, quality, and reliability by enabling faster, more efficient creation, transfer, and review of the design and fabrication phases of the project as it develops.

Information Management

Marine life-cycle information management, combined with company best practices, is the basis for engineering knowledge management. Effective engineering knowledge management not only increases innovation – but also protects company intellectual property.

SmartMarine Enterprise makes information available to members of the project in a context-sensitive manner, which helps to address problems that can cause lost revenue due to missed deadlines, unnecessary material purchases, design and fabrication rework, and delays in ship deployment, platform installation, and operations.

Importance of Data

Your data is as much of an asset as the physical marine structure itself. Data created in your projects is important to profitability, because its value increases over time. Intergraph captures data and maximizes data reuse to produce the most efficient design possible. Being able to achieve this in an integrated solution is a unique differentiator from other solutions.

HISTORY OF EXCELLENCE

For 25 years, Intergraph has supplied design and information management solutions to the marine industries:

- 1984 • First use of Ship Outfitting system
- 1991 • Won U.S. Navy CAD2 contract
- 1995 • Formed industry partnership with Avondale
- 1996 • IAI partnership awarded U.S. Navy contract
 - Awarded DARPA COMPASS program
 - GRAD consortium formed
- 1997 • First use of SmartMarine Enterprise outfitting
- 2002 • Alliance formed with DNV
 - First use of SmartMarine Enterprise structures
- 2003 • Material & PIM added to SmartMarine Enterprise
- 2004 • Samsung & others launch SmartMarine Enterprise-designed ships
- 2005 • SmartMarine Enterprise integrated with Tribon as first step of replacement
- 2007 • SmartMarine 3D launched
- 2009 • Intergraph continues its industry leadership with SmartMarine Enterprise

“ SmartMarine 3D will pay dividends as SHI expands its presence in the global shipbuilding design and production market, and it will impact offshore business in the future as well. SmartMarine 3D will make tremendous changes in the traditional ship design and construction process, and I believe these changes are well on the way to our goal of significantly reducing design and construction errors. We can also reduce shipbuilding time and man-hours while better automating our production activities in the near future. ”

Yeong Soo Bae
Vice President
Samsung Heavy Industries (SHI)



RETURN ON INVESTMENT

Our customers expect to improve their delivery schedules for major naval and commercial ships, offshore platforms (including semi-submersibles), and FPSOs by 50 percent when they fully implement SmartMarine Enterprise and adjust yard processes to maximize the system processes.

The solution will help you:

- Reduce engineering labor hours by automating traditional manual CAD tasks. SmartMarine Enterprise automatically produces drawings and reports as a by-product of the engineering design.
- Eliminate multi-site execution issues. SmartMarine Enterprise provides built-in support for global project execution from a central shared database.
- Enhance capital performance using sustainable standardization of all design components. SmartMarine Enterprise uses rules and data relationships to identify standard components, stopping variances between similar design decisions.
- Reduce construction costs up to 10 percent and inventory expenses up to 15 percent.
- Reduce total installed cost (TIC) as much as 3.5 percent.
- Reuse your technical information.

VISION AND SCOPE

The vision for SmartMarine Enterprise is to enable faster, better, and cheaper design and construction of marine structures. SmartMarine Enterprise's architecture eliminates the CAD-centric focus of traditional design systems.

Because the new software technology does not require a proprietary CAD engine, it frees shipbuilders and engineering companies from the

constraints of now-outdated CAD systems. This is a technological breakthrough, because legacy architectures cannot support today's work process demands, which include data reuse, global work-sharing and distributed engineering, configuration management, life-cycle data management, cost optimization, business system integration, and Web access to both graphical and tabular information.

The SmartMarine Enterprise architecture allows for a high degree of flexibility, including customization, integration of suppliers and subcontractors, and automation of fabrication and associated work processes.

As a modular solution, SmartMarine Enterprise makes work faster and easier and its streamlined interface substantially reduces the user learning curve. The scalability of the Microsoft® architecture protects legacy data and current software systems.

Finally, SmartMarine Enterprise's data model provides full access to engineering data, capturing graphics and associated information, as well as behavior and design intent. As a result, it is the foundation for a shared repository of all ship and platform design, construction, and management information.

SOLUTION STRATEGIES

Intergraph is able to uniquely offer an integrated suite of engineering and data management applications to address shipbuilding and offshore project core requirements, including:

- Information Management
- Global Workshare
- Materials and Procurement Management
- Engineering Project and Cost Control
- Hull Preliminary Design
- Hull and Surface Design and Calculations

- Hull and Structure Design Modeling
- 3D Outfitting Preliminary Design
- Fabrication and Construction Planning
- 3D Outfitting Design Modeling
- 3D Model Design Reviews
- Handover and Commissioning

Some of the products used to support your workflow include:

SmartMarine 3D

SmartMarine 3D enables you to create 3D function/system views of marine structures with integration to class societies' design tools such as DNVS' Nauticus Early Design.

SmartPlant® P&ID

This rule-based engineering solution creates intelligent piping and instrumentation diagrams (P&IDs) while building a comprehensive data model.

SmartPlant Electrical

SmartPlant Electrical provides a strong platform to address the electrical engineering and design needs of marine structures.

SmartPlant Instrumentation

This instrument engineering application enables you to design, manage, and maintain instruments across the complete life cycle.

SmartPlant Layout

SmartPlant Layout enables preliminary 3D marine layout, including proposal development, early design estimates, and layout optimization.

SmartPlant Review

SmartPlant Review is the complete visualization environment for interactively reviewing and analyzing large, complex 3D models of marine assets.

SmartPlant Materials

SmartPlant Materials enables integrated materials management in marine structure design.

SmartPlant Foundation

SmartPlant Foundation is the e-engineering integration hub for the SmartPlant Enterprise. It is a through-life cPLM system that is also used as an engineering data warehouse application integration hub and document and workflow management system, as well as an engineering information portal.



COMPLEMENTARY APPLICATIONS

Intergraph is able to offer a large range of complementary applications from its strategic partners and other third-party application vendors. Using these with SmartMarine Enterprise applications can greatly increase the ability to make further dramatic reductions in schedules and increase the quality of design and project deliverables. The list is not comprehensive, but is representative across all disciplines and parts of the engineering life cycle:

- ABS
- ARES Corporation
- Aspen Technology
- BitWyse Solutions, Inc.
- COADE
- CSCAM
- Det Norske Veritas Software
- Emerson Process Management
- EzGraph Co. Ltd.
- Flowserve
- Hazid Technologies Ltd.
- Leica Geosystems
- Lloyd's Register
- Meridium
- Microsoft Corporation
- MRO Software
- PIPENET
- Primavera Systems, Inc.
- Skire
- Structural steel analysis software vendors
- Structural steel fabrication and detailing software vendors
- Tracto-Technik
- Victaulic





ABOUT INTERGRAPH

Intergraph is the leading global provider of engineering and geospatial software that enables customers to visualize complex data. Businesses and governments in more than 60 countries rely on Intergraph's industry-specific software to organize vast amounts of data into understandable visual representations and actionable intelligence. Intergraph's software and services empower customers to build and operate more efficient plants and ships, create intelligent maps, and protect critical infrastructure and millions of people around the world.

Intergraph operates through two divisions: Process, Power & Marine (PP&M) and Security, Government & Infrastructure (SG&I). Intergraph PP&M provides enterprise engineering software for the design, construction, and operation of plants, ships, and offshore facilities. Intergraph SG&I provides geospatially powered solutions to the defense and intelligence, public safety and security, government, transportation, photogrammetry, utilities, and communications industries.

For more information, visit www.intergraph.com.



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