

SMARTMARINE[®] ENTERPRISE FOR OFFSHORE

Improving the Complete Offshore
Project Life Cycle







THE FUTURE TODAY: SMARTMARINE® ENTERPRISE

Historically, companies around the world have had to make considerable initial and ongoing investments to develop applications and integrate them with commercial solutions. In recognition of this business problem, Intergraph® has spent the last 25 years developing and bringing to market a set of integrated applications that deliver and define the engineering, construction, and fabrication enterprises. SmartMarine Enterprise gives offshore clients the largest set of market-leading applications, starting from the schematic design of an asset through to physical modeling, materials management, construction management, fabrication automation, and information management.

Intergraph's SmartMarine Enterprise applications are delivered with "out-of-the box" (OOTB) integrated architectures that seamlessly integrate the flow of information between applications. Data and design parameters are entered only once into the authoring disciplines and reused in downstream disciplines (for example, process data from the P&ID is published into the 3D model). The OOTB integration is not a simple data exchange process. It is a change management environment that facilitates publishing, retrieving, reviewing, and comparing data and documents electronically between disciplines.

SMARTMARINE ENTERPRISE

**PROVIDES A SINGLE, FULLY
INTEGRATED ENVIRONMENT
FOR DESIGN, FABRICATION,
ASSEMBLY, AND LIFE-CYCLE
MANAGEMENT.**

**Marine, offshore, and engineering companies
can make better decisions to facilitate
global design, construction, and life-cycle
optimization – ultimately making your company
more competitive.**

All of Intergraph's enterprise applications deliver global worksharing capabilities, providing companies with the ability to electronically share work internally or externally around the world in real time. In addition to the schedule benefit of leveraging other offices, Intergraph workshare capabilities improve quality by electronically enforcing all of the project or company standards across the global share and maintaining interface points within an application and between different discipline applications.

SmartMarine Enterprise solutions include rule-driven design, relationally linked data between design disciplines, and complete visible management throughout the life of your offshore and marine facilities.

SMARTMARINE ENTERPRISE GIVES YOUR COMPANY RETURN ON INVESTMENT

When our clients fully implement SmartMarine Enterprise design applications and adjust processes to maximize the system, they report improved delivery schedules achieved with increased detail design productivity of up to 30 percent. Adding the enterprise materials, fabrication, and construction applications can reduce construction costs by 12 percent and total installed cost by as much as 3.5 percent.

Core Data Model Ensures a Solid Foundation for Managing Engineering Data

Data created in projects is important to profitability, because the value of data increases over time. SmartMarine Enterprise's data model provides full access to engineering data, capturing graphics and associated information, as well as behavior and design intent. It is the foundation for a shared repository of all platform design, construction,

and management information. With SmartMarine Enterprise, life-cycle information management and company best practices can form the basis for offshore engineering knowledge management – which increases innovation and protects company intellectual property.

Breadth of Integrated Applications Addresses Entire Marine Workflow

SmartMarine Enterprise's breadth of integrated applications addresses all critical information life-cycle requirements for offshore facilities: hull and topside preliminary design, structure design modeling, 3D plant/outfitting, fabrication and construction planning, 3D outfitting design modeling, and 3D model design reviews, including information management, materials and procurement management, engineering project and cost control, and handover and commissioning.

Flexible, Non-Proprietary Architecture Easily Adapts to Modern Enterprise Requirements

Microsoft® standard architecture protects legacy data and current software systems. Unlike legacy architectures that cannot support today's work process demands, SmartMarine Enterprise's architecture supports data reuse, worksharing, distributed engineering, configuration management, life-cycle data management, cost optimization, business system integration, Web access to both graphical and tabular information, and other workflows. The highly flexible architecture enables customization, integration of suppliers and subcontractors, and automation of fabrication and associated work processes.

SMARTMARINE ENTERPRISE

ENGINEERING & SCHEMATICS	3D MODELING & VISUALIZATION	ANALYSIS	PROCUREMENT, FABRICATION & CONSTRUCTION	SMARTPLANT ALLIANCE & PARTNERS
SmartPlant® P&ID/ Design Validation	SmartMarine 3D	CAESAR II®	SmartPlant Materials	Technology members
SmartPlant Instrumentation	SmartPlant 3D	PV Elite®	SmartPlant Reference Data/ Standard Database	Service members
SmartPlant Electrical B & D	PDS®/FrameWorks® Plus/SupportModeler™	TANK™	SmartPlant Spoolgen®	Content members
SmartPlant Process Safety	SmartPlant Review/ Publisher		SmartPlant Construction	Complementary solutions
SmartSketch®	SmartPlant Layout			
SmartPlant Explorer	SmartPlant Markup			
SmartPlant Isometrics	CADWorx®			
INTEGRATION AND INFORMATION MANAGEMENT				
SmartPlant Foundation				
AUTOMATION AND IMPLEMENTATION SERVICES				

Automated Features Reduce Project Time and Cost

SmartMarine Enterprise reduces labor hours by automating traditional manual CAD tasks. It automatically produces drawings and reports as a by-product of the engineering design. Design reuse wizards capture data and provide an integrated environment to repurpose the design as catalog items. Context-sensitive, change-managed information is available to all project team members. This minimizes the risk of missed deadlines, unnecessary material purchases, design and fabrication rework, and delays in platform deployment, installation, and operations.

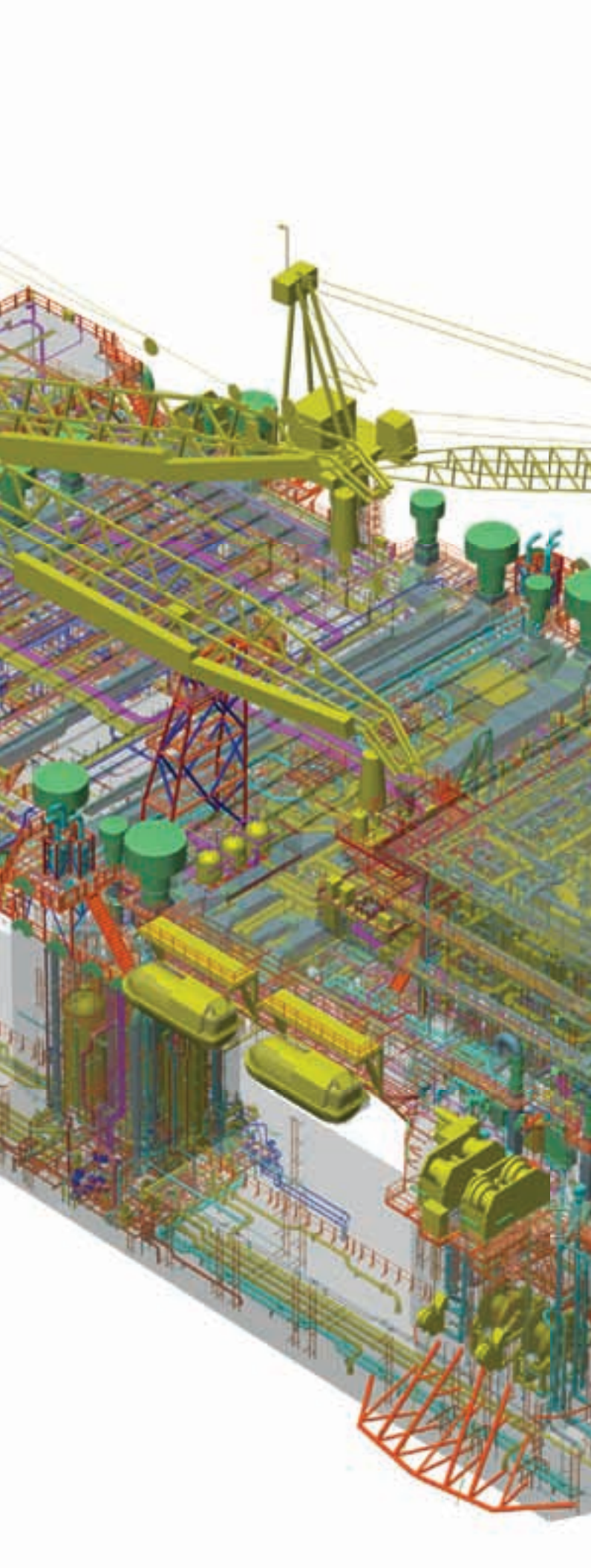
Automated Interface Management Reduces Cost and Schedule

SmartMarine Enterprise's streamlined interface substantially reduces the user learning curve. Global interfaces among engineering disciplines, companies, and major project phases are electronically managed. Global project execution from a central shared database prevents multi-site execution issues and extends engineering into fabrication and construction – which eliminates issues with disparate systems or manual interfaces.

Rule-Driven Design Improves Productivity and Quality

SmartMarine Enterprise's engineering rules ensure design accuracy and consistency, automate work processes, and allow designers to focus on the task at hand, rather than on how to operate the technology. Built-in rules and data relationships help identify standard components and eliminate variances between similar design decisions. Rules engines increase productivity, quality, and reliability by enabling faster, more efficient creation, transfer, and review of the design and fabrication phases of the project.





“ SmartMarine 3D improved our productivity by reducing the man-hours required to design projects. Its user-friendly interface and excellent graphics are an added advantage for us. ”

Aziz Merchant
General Manager, Engineering
Keppel O&M

This isometric view of a semi-submersible drilling tender was created with SmartMarine 3D to perform detail engineering design.

Image courtesy of Keppel FELS Limited



BUILD YOUR OFFSHORE DESIGN AND MANAGEMENT SOLUTION STEP BY STEP

Do you need a 3D design solution or an engineering database today? Intergraph makes it simple. Select the SmartMarine Enterprise components you need, and enjoy the flexibility to add solutions that can easily share information in the future. Components include applications from the SmartPlant and SmartMarine families.

SmartPlant Foundation

SmartPlant Foundation is the information management solution that controls the availability, integrity, and accuracy of all offshore engineering information. It serves as a comprehensive electronic library for the entire life cycle of an offshore structure. SmartPlant Foundation also accommodates change management, workflow management, and document management. It houses a facility's design, modifications, and upgrades – effectively managing the configuration from front-end engineering design to plant decommissioning.

SmartMarine 3D

SmartMarine 3D is a single product modeling system that supports and streamlines the design, detailing, and fabrication for floating and fixed offshore facilities. Its proven design, production, and life-cycle management capabilities are contained within one integrated environment.

SmartPlant Layout

SmartPlant Layout tools for preliminary 3D plant layout include proposal development, early design estimates, plant layout optimization, automatic pipe routing, layout case management, and cost

estimation. The software allows reuse of preliminary plant layout designs without additional remodeling.

SmartPlant Markup

SmartPlant Markup provides precision viewing and markup capabilities for the most widely used formats of engineering and business documents without the authoring application – allowing for cost-effective collaboration on design and construction projects.

SmartPlant Review

SmartPlant Review is the complete visualization environment for interactively reviewing and analyzing large, complex 3D models during engineering, construction, operations, and maintenance. SmartPlant Review allows views from any design perspective, helping facilitate project approvals by creating clear presentations to technical and non-technical audiences. SmartPlant Review Publisher supports the conversion of common plant formats for viewing in SmartPlant Review.

SmartPlant P&ID

SmartPlant P&ID creates intelligent piping and instrumentation diagrams (P&IDs) – the “roadmap” of the plant – while building, managing, and storing a comprehensive data model for design, construction, and maintenance. SmartPlant P&ID Design Validation provides an automated workflow for examining data attributes and topology between the schematic and 3D environments.

SmartPlant Electrical

SmartPlant Electrical addresses the electrical engineering and design needs for the entire plant life cycle – including startup, continuous operation, emergencies, and shutdowns. SmartPlant Electrical

generates single-line diagrams and schematics automatically, creating graphical reports based on data provided by the engineers.

SmartPlant Instrumentation

SmartPlant Instrumentation is the world's leading application for instrumentation and control systems engineering, design, and maintenance. It stores and manages historical instrumentation and control data in a single easily accessible plant database to ensure consistency across the instrument tasks and deliverables. SmartPlant Instrumentation minimizes unscheduled shutdowns because only up-to-date information is used for planning and maintenance.

SmartPlant Isometrics

SmartPlant Isometrics is a powerful Microsoft Windows®-based application that reduces from hours to minutes the time spent creating isometric drawings – compared to using paper and pencil or 2D CAD systems.

SmartPlant Spoolgen

SmartPlant Spoolgen for fabricators incorporates fabrication and construction information to design isometrics (IDFs and PCFs) from SmartMarine 3D and automatically generates drawings and reports without recreating material data.

SmartSketch

SmartSketch is a 2D drawing generation software application that provides business diagramming with high-end drawing technology. SmartSketch offers a cost-effective precision engineering and drafting technology that gives engineering, construction, and fabrication enterprises and offshore and marine owners a competitive edge.





**INTERGRAPH
SMARTMARINE
USERS REPORT
IMPROVED
DELIVERY
SCHEDULES
WITH
INCREASED
DETAIL DESIGN
PRODUCTIVITY
OF UP TO
30 PERCENT.**

SmartPlant Process Safety

SmartPlant Process Safety is a safety modeling application that captures company HAZOP knowledge and applies it in HAZOP studies to lower operational risk and shorten schedules without compromising quality. It enables earlier hazard identification/remediation before change becomes costly.

SmartPlant Materials

SmartPlant Materials offers an integrated life-cycle material and supply chain management solution that provides a common collaboration platform for all partners in a project's supply chain – from preliminary design, to detail engineering, through purchasing and construction. SmartPlant Materials allows sharing of data with different design systems, clients, subcontractors, and suppliers, as well as data reuse in subsequent projects.

SmartPlant Reference Data

SmartPlant Reference Data provides materials libraries and enables database standardization, change management, and global worksharing via the Web. It maintains catalog, pipe specifications, and interfaces for all of the SmartPlant and SmartMarine core applications, and includes interfaces to PDS, PDMS Interface, SAP® R/3®, and Open Ident. Standard Database for SmartPlant Reference Data offers a pre-configured, best practice catalog of standard OOTB material parts.

SmartPlant Construction

SmartPlant Construction manages construction resources, materials, and schedules of construction companies, project management offices, fabricators, and owners. SmartPlant Construction helps companies realize significant savings throughout the life of a construction project by incorporating the dynamic inputs from engineering, procurement,

fabrication, site materials management, and labor plans.

Complementary Applications

Intergraph offers a wide range of complementary applications from strategic partners and other third-party application vendors. Using these with SmartMarine Enterprise further increases your ability to make dramatic schedule reductions and increase the quality of design and project deliverables.

COMPONENT HIGHLIGHTS

SmartMarine 3D for Offshore

SmartMarine 3D is a single product modeling system that supports and streamlines all of the design, detailing, and fabrication for floating and fixed offshore facilities. SmartMarine 3D is a data-centric, multidiscipline environment that encompasses all of the 3D modeling and automatic drawing functions necessary to perform modeling design tasks, such as structural, piping, equipment design, electrical, and HVAC, as well as architecture/living quarters. Additional SmartMarine 3D applications complement these major functions to create the fabrication details, assembly sequencing, and drawings. SmartMarine 3D's advanced scalability and modular design enables organizations of any size to configure the exact type of system that meets their workflow and workload requirements.

Single Application Scope and Database

SmartMarine 3D integrates seamlessly and shares information with other SmartMarine Enterprise applications, as well as integrated legacy systems. SmartMarine 3D is a single integrated environment that provides all of the capabilities to design, fabricate, and build a marine facility. Using one application for the whole process reduces IT costs for managing multiple systems and eliminates costs associated with integrating disparate databases. The single environment improves offshore design safety, quality, and productivity, while enabling you to rapidly adjust to your customers' change requests.

Non-Proprietary Database and Applications

SmartMarine 3D has no proprietary software languages or applications. It natively uses all Microsoft technologies for every aspect of the application, including Microsoft SQL Server® database, Microsoft Excel® reporting, Microsoft Visual Basic®, and Microsoft .NET configuration tools. No CAD engine is required, and there is no dependency on CAD file structures.

Global Workshare

SmartMarine 3D enables designers, yards, sub-contractors, suppliers, authorities, and others to easily and effectively manage and execute projects across company and country borders. Powerful Microsoft SQL Server relational database replication tools allow disciplines to work concurrently across multiple locations – users share all modifications in near real-time, and built-in security features restrict access as needed. Changes transmit asynchronously between sites, drastically improving network performance. If communications are lost, the local database continues to run with its current information, and changes are queued until communications are re-established.

**INTERGRAPH'S
SMARTMARINE
3D REDUCES
THE RISK OF
HUMAN ERROR
AND ENSURES
SAFER, MORE
RELIABLE,
CONSISTENT
DESIGNS AND
END-BUILDS
WITH FEWER
WORK-AROUNDS.**

Automated and Managed Drawing and Report Deliverables

Automated drawings and reports reduce the cost of design and provide accurate, up-to-date documentation of the design at any time. SmartMarine 3D generates fully dimensioned, annotated, and time/date-stamped drawings and reports that are based on rules for view, scale, font styles, drawing borders, background sheets, etc. Drawings correlate with the 3D model, so changes in the model will trigger an automatic notification that the drawing/report is out of date and needs to be updated. Reports are generated using Microsoft Excel templates.

Change Management and Rules Engine for Spec-Driven Design

SmartMarine 3D's patented relationship management engine establishes and maintains relationships and changes between physical objects. The spec-driven environment enforces a project's engineering rules across all disciplines. For example, if a pipe support's position changes, then the relationship engine automatically updates its relationship to the pipeline and to the structure to which it is attached. Built-in correlations enable on-screen graphical checks. The relationship engine also distinguishes significant changes from insignificant ones.

Interactive and Batch Interface Management

SmartMarine 3D provides two types of interference detection. Database Interference Detection is a continuous batch process that detects and stores

hard and soft interferences between all objects in the database – where they can be graphically displayed and reported. Local Interference Detection detects interferences between modified objects and other objects in the current workspace – providing the routing user immediate feedback during model creation.

Plant/Outfitting Design Application and Scope

Backed by more than US\$100 million in research and development, SmartMarine 3D represents the industry's most advanced engineering design system. The common modeling environment crosses all disciplines: structural, equipment, piping, hangers, electrical, HVAC, and buildings. SmartMarine 3D streamlines offshore processes while preserving the integrity of design data and making data more usable (and reusable) throughout the entire life cycle of the structure.

Task “Wizards”


SmartMarine 3D walks users through the sequence of steps to execute a command. Rather than relying on dialog boxes and pull-downs or toolbars, SmartMarine 3D's simplified user interface reveals only input fields and options pertinent to the current operation. Design reuse wizards allow best-in-class design configurations to be saved – providing quicker, more accurate responses to requests for proposals and fast-track projects.

“**We have been using SmartMarine 3D in production on numerous offshore projects, [which] is helping us achieve greater productivity and higher quality designs. The enhancements included in the newest version of SmartMarine 3D will assist us in gaining a further competitive edge within the marine industry.**”

Liang Guoming
Deputy General Manager, Technical Center
COSCO Shipyard Group





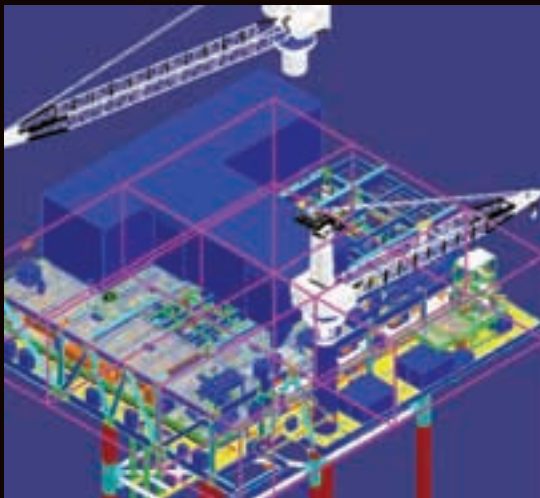
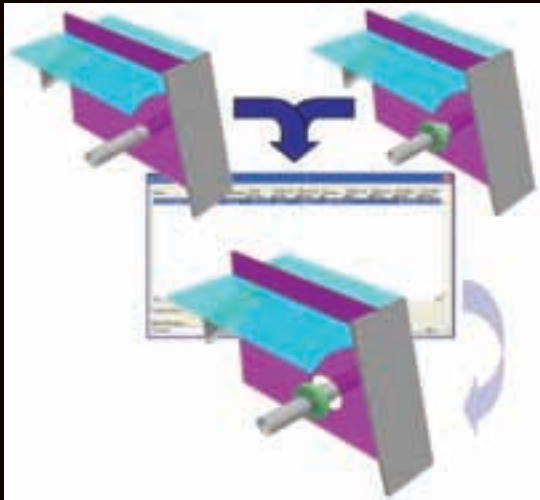
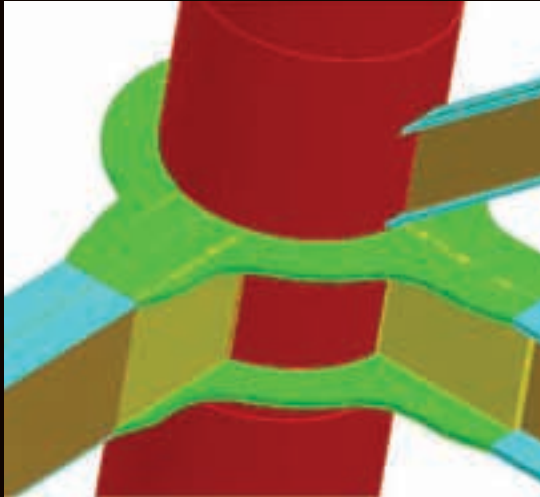


“ The hole manager in SmartMarine 3D is so intuitive – when you move a pipe that goes through a hole in a plate – the hole moves with the pipe based on your rules. It makes so much sense – why can’t all design be this simple? ”

SmartMarine 3D User

“ SmartMarine 3D’s flow-through data from 2D to 3D design (and back) gives us a fail-safe way to ensure all changes have been made to our drawings and our models. We’ve almost eliminated last-minute workarounds due to a missed design component in one aspect of the process. ”

SmartMarine 3D User



Structural Modeling

Some of the critical offshore structural modeling features of SmartMarine 3D include:

- Curved plates and profiles
- Structure relationship rules engine
- Rule-based joints
- Built-up members
- Advanced plate systems (APS) for rule-based design of complex plate structures such as nodal connections
- Automated detailing for modeling, detailing, and fabrication

Hole Management

With SmartMarine 3D, outfitters can request holes/penetrations in structural objects such as decks, walls, or profiles. Structural engineers will be notified and requested to approve the physical hole to be made based on structural integrity verification. You can place single or multiple holes, and multiple objects can go through the same hole. The system can automatically determine hole size and geometry. For example, you can place sleeves automatically. Automatic relationships between outfitting objects and the penetration ensure the penetration updates properly if the object changes.

Planning

SmartMarine 3D's planning environment reduces the overall project schedule by allowing you to define physical boundaries and construction packages for the different modules/blocks at early stages of your project. These dynamic, multi-discipline definitions detail the objects belonging to each block and the total volume, weight, and center of gravity for the module. The modules are further divided into assemblies and sub-assemblies that contain detailed assembly orientations, installation sequences, and work center assignments. The definitions are made across a database, and are not constrained by files or the plant breakdown structure, which enables

you to modify them at any time to reflect fabrication/ installation methodology changes. SmartMarine 3D provides even greater productivity benefits when installed into Intergraph's SmartMarine Enterprise environment, which expands and integrates the modeling capabilities of Intergraph's schematic design and information management applications.

TOP BENEFITS ... DIRECTLY FROM DESIGNERS

Why do leading offshore companies choose SmartMarine 3D? Once designers have worked with the product, they don't want to switch back! Here's why:

- "SmartMarine 3D allows you to design once. The system rules are capturing and maintaining the design intent, even through multiple changes."
- "SmartMarine 3D minimizes rework and errors – the clash system runs automatically in the background to ensure you don't have to remember to run separate checks."
- "Drawings in SmartMarine 3D are considered an object just like a pipe or a piece of steel – alive at all times, and linked. You can pull up the drawing, click on a pipe, and it's highlighted and selected in your model."
- "Onshore or offshore, you need piping support. SmartMarine 3D automatically puts in any of the turns or flanges that are needed; you can change the options as you go. Since the system is rule-based, it won't let you add something that doesn't fit with the specs. No more specifying each individual piece!"
- "SmartMarine Enterprise for Offshore offers connectivity and relationships between joining design members (columns, beams, pipes, etc.) Since the software is rule-based, when elements of a design are modified later, other elements change with it automatically."

FIND OUT MORE ABOUT HOW SMARTMARINE ENTERPRISE CAN WORK FOR 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) by as much as 3.5 percent.
- Reuse your technical information for construction, operations, maintenance, revamping, and scrapping.

Find out more about how SmartMarine Enterprise from Intergraph can save you money and increase your project efficiency. Visit www.intergraph.com/go/offshore for more information, or contact sales@intergraph.com to speak to a global specialist today.

INTERGRAPH: HISTORY OF EXCELLENCE

INTERGRAPH HAS PROVIDED INNOVATIVE PLANT AND MARINE INFORMATION MANAGEMENT AND DESIGN SOLUTIONS TO THE PROCESS INDUSTRIES SINCE 1978:

- 1969 ● Begins as M&S Computing by engineers who worked on the Apollo moon orbit
- 1978 ● Offers company's first plant design solution
- 1980 ● Becomes Intergraph
- 1984 ● Launches PDS, now the world's leading plant design solution
- 1991 ● Won U.S. Navy CAD2 contract
- 1996 ● IAI partnership awarded U.S. Navy contract
Awarded DARPA COMPASS program
GRAD consortium formed
- 1998 ● Introduces SmartPlant Foundation, the first data management system specifically for the plant industry; now 450-plus customers strong
- 1999 ● Acquires SmartPlant Instrumentation, now the industry's No. 1 application for instrumentation and control systems engineering, design, and maintenance
- 2001 ● Acquires SmartPlant Materials, now the industry's No. 1 materials management solution
- 2003 ● Launches Smart 3D technology (SmartPlant 3D and SmartMarine 3D)
- 2004 ● Samsung Heavy Industries and others launch SmartMarine Enterprise-designed ships
- 2006 ● Acquires ISOGEN® and SPOOLGEN to provide complementary automatic piping isometric drawings generation
- 2010 ● Acquires CAESAR II to provide pipe analysis
- 2010 ● Intergraph becomes part of Hexagon AB: the design of the virtual meets the measurement of the real world to better manage the rapidly changing offshore industry









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 to make processes and infrastructure better, safer, and smarter. The company'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, operation, and data management of plants, ships, and offshore facilities. Intergraph SG&I provides geospatially powered solutions to the public safety and security, defense and intelligence, government, transportation, photogrammetry, and utilities and communications industries. Intergraph Government Solutions (IGS) is an independent subsidiary for SG&I's U.S. federal and classified business.

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