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Insufficient communication has the potential to throw shipbuilding off course

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Compared with the automotive or aerospace industry, the shipbuilding industry is characterized by extremely short development and production cycles. It takes only a little more than a year for a vessel to evolve from initial design to launch. Up to 200 suppliers may be involved in its development. Insufficient communication between the shipyards and their partners is becoming an ever more significant obstacle in the development process. Fortunately, solutions for process automation in product data communication provide an elegant way of avoiding such problems.

Shipbuilding is doing well these days. This phenomenon is benefiting German shipyards and, in particular, German suppliers, who rank among the leaders worldwide. While German shipbuilders have a global market share of just over three percent, placing fourth behind South Korea, Japan and China, German suppliers are fighting hard to take the claim to first place away from their Japanese competitors. More than half of the annual sales of over 15 billion euros achieved domestically in the shipbuilding industry and maritime technology sector is due to the supply industry, with 60 percent of sales coming from export markets. The supply industry comprises approximately 400, mostly small and mid-sized, companies who employ a workforce of over 70,000.

To a very large extent, the demand for ships is determined by the


Source: Meyer Werft GmbH

global need for transport, or more precisely by the shipping companies' forecasts of how this need will grow in coming years. On the basis of these forecasts, they order ships which vary in both size and speed, factors which have a massive impact on their design. "If you want to make a ship travel one knot faster, you can't simply install a more powerful engine: you have to redesign it from top to bottom to take account of the modified hydrodynamic requirements profile," explains Prof. Dr.-Ing. Robert Bronsart from Rostock University's Center of Marine Information Systems.

Specialist suppliers achieve high value added

Building ships is a very labor-intensive business. As a result, German companies can only prevail over their Far Eastern competitors by providing innovative, customer-oriented solutions. It is not for nothing that shipyards now invest approximately ten percent of their revenues in researching and developing innovations, most of which are incorporated in the vessels during the manufacturing process. The market for ships meeting exacting technical requirements is characterized by small unit quantities and extremely project-specific production processes. In a similar way to the aerospace industry, there are a large number of specialist suppliers and sub-contractors who contribute up to 70 or 80 percent of the value added depending on the type of ship – with a higher proportion by nature in the case of a cruise liner than a container ship.

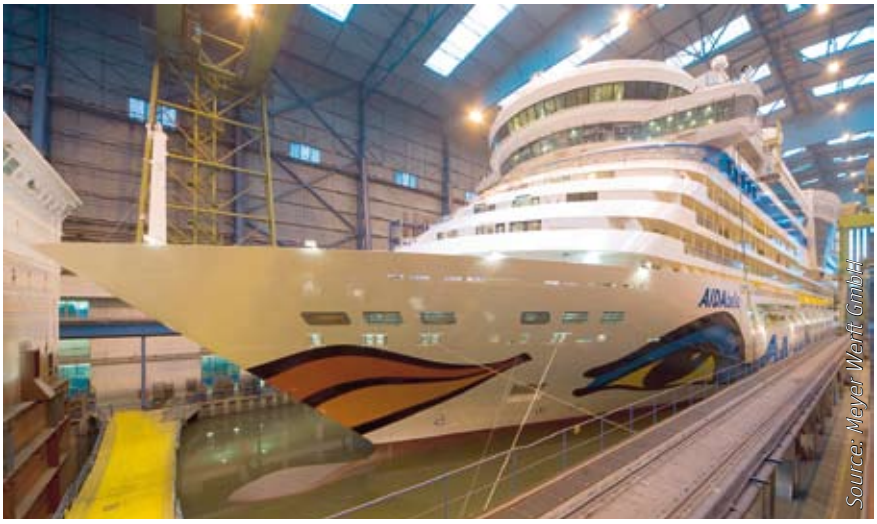
A lack of young engineers in the shipbuilding industry

Even though there is potential for rationalization in the field of supplier integration, the cooperation between shipyards, shipping companies, suppliers and the classification authorities works relatively well, as Professor Bronsart emphasizes. It would not otherwise be possible to achieve the short development cycles. To quote Professor Bronsart, "employees in the shipbuilding industry identify strongly with their product and do everything possible to construct it on schedule." Unlike in the aviation industry, where the delays regularly extend over several months, the handover date in the shipbuilding industry is sacred. Failure to respect it results in severe contractual penalties which may threaten a shipyard's survival."

Despite this, many shipping companies currently have to endure a long wait for their vessels because the shipyards' order books are so completely full that it is difficult to find an open slot. The boom also has its downside. Shipyards are complaining that the high workload is increasingly resulting in quality problems and material bottlenecks. This is particularly true of steel, which is used in large quantities in ships and is also required for important system components such as the engines, which are usually needed shortly after the keel is laid down. If these components are supplied late, the installation of the engine room and the surrounding body sections must be delayed, which has negative repercussions on the costs. What is more, suppliers of maritime-specific components such as air conditioning systems are faced with the problem that they do not possess the engineering capacity needed to cope with the flood of orders. In Professor Bronsart's opinion, "at present, the lack of young engineers is one of the greatest challenges facing the shipbuilding industry."

One way of making use of these sparse resources is to improve the efficiency of communications within the development networks involved in the ship development process so that engineers can concentrate more fully on their own specific tasks. Indeed, the communication work involved in distributed ship development is greatly underestimated by the parties involved. At present, employees spend up to 50 percent of their working time procuring, preparing and documenting information and performing other indirect tasks, as Professor Bronsart recently explained at PROSTEP AG's Shipbuilding Forum in Rostock.

Between the shipyard and engineering office alone, approximately 800 communications processes take place over a period of a little more than a year, and 80 percent of these are in response to communication errors. The supplied information may be unsuitable for the task in question, not understandable, incomplete or incorrect. Moreover, the parties involved often fail to understand who needs the information in the process and when. These communications deficiencies mean that many errors are detected too late and their consequences are underestimated. To make communications more efficient, what is needed is a technical infrastructure which makes it possible to both provide product and process



information to all those involved and to manage changes transparently, explains Professor Bronsart. An information exchange platform can only function if the data, systems and processes present in the shipyards and at the suppliers are harmonized. In this respect, companies operating in the shipbuilding industry – compared with those in the automotive industry, for example – still have a way to go.

It is true that for more than 25 years, shipyards have been using special 3D programs which enable rule-based description of a ship's hull and which are different from the more geometrically focused mechanical CAD systems which have only just started to support this knowledge-based approach during the past few years, as Dr. Matthias Grau, Shipbuilding Coordinator at PROSTEP, emphasizes. However, if the development process is considered as a whole, the 3D data chain as yet leaves many steps uncovered and, most importantly, is anything but homogeneous in terms of the employed formats.

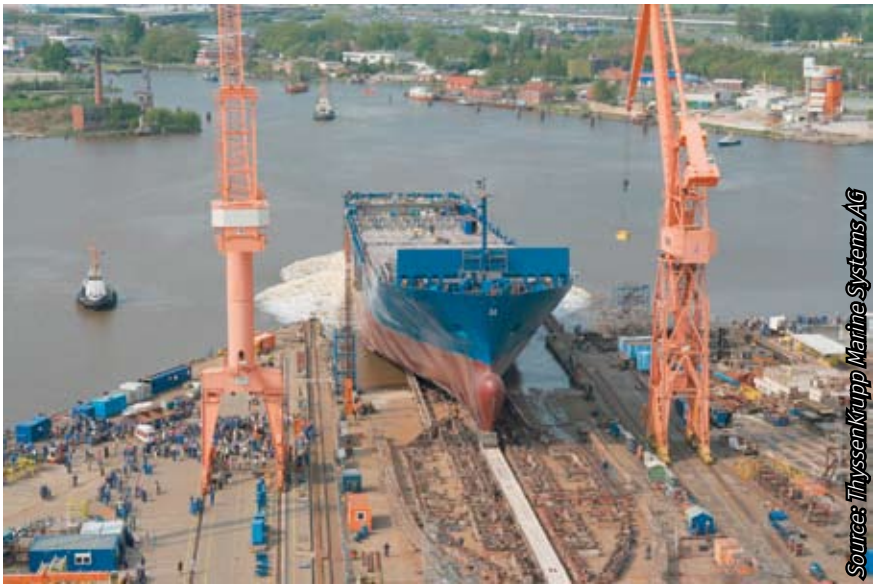
Heterogeneous system landscapes still predominate

"Unlike car manufacturers, shipyards cannot simply tell their system suppliers which CAD systems they ought to use because many of them also work for customers in other industries," says Dr. Grau. Quite apart from that, the system landscape within any given shipyard is not uniform because no CAD system is able to cover all the different requirements involved in ship development satisfactorily.

Alongside the special systems for the hydrodynamic design of the hull shape or the vessel's steel structure, the machinery, piping, equipment and outfitting are often designed using widely available mechanical 3D CAD systems such as Catia or NX. These systems, however, are only poorly integrated in the existing system landscape – either because of a lack of the necessary interfaces or insufficient integration expertise. PROSTEP is currently working together with Blohm & Voss Nordseewerke GmbH in Emden, a shipbuilding company belonging to ThyssenKrupp Marine Systems (TKMS), to develop an interface between NX and Tribon M3 Hull. This interface will make it possible to transfer the NX-based outfitting design data to the TRIBON steel construction package, where it can be used for the subsequent CNC-based manufacturing processes.

In this type of project, the Darmstadt-based company, which specializes in consulting and solution development for partner and process integration, draws on its many years of experience with this type of project in the automotive and aerospace industries. This expertise is also made available to customers by means of a hosted service, i.e. they can upload their data files via an Internet portal for automatic conversion to the recipient's format. This online conversion service is primarily intended for suppliers who do not regularly have to convert data and for whom the target format may vary, which means that it does not make sense economically for them to invest in the necessary tools and expand their knowledge of the conversion operations.

Like the automotive and aerospace industries, the shipbuilding industry is facing an increasing diversification of the supplier market. During a project, shipyards will typically work with between 40 and 50 system suppliers, who, in turn,



coordinate the majority of the individual suppliers. This means that the CAD data exchanged between the shipyards and the first-tier suppliers is growing in both volume and complexity, thus making a more thorough automation of the data exchange processes necessary. However, as a result, in addition to the CAD data itself, it is also necessary to exchange increasing volumes of structure information, attributes and other metadata required to efficiently and correctly process the CAD data.

Suppliers need the structure data

In other industries, this data is usually managed by so-called PDM (Product Data Management) systems, which are not as yet in widespread use in the shipbuilding industry. This has to do with the fact that the CAD systems specific to the shipbuilding industry, such as Tribon, traditionally provided some of the functions necessary for the structured storage of data and for process control. From this perspective, shipyards can identify only limited benefits in acquiring independent PDM solutions. However, with the use of mechanical CAD applications in areas such as piping and outfitting, it has become increasingly clear that it is not possible to organize the 3D data derived from various different sources within a digital model of the ship without using an overarching product data management system. Whenever this type of backbone is implemented, it is necessary to merge PDM information from a variety of sources. This argues in favor of using an open, system-neutral integration platform which possesses standardized interfaces to commonly used PDM and ERP systems.

The increasing amount of development work contracted to individual suppliers raises the question of how context information can be communicated to them. For example, they need the surrounding geometry from the steel structure in order to install air conditioning and ventilation systems or the piping for the water supply, and they need to be able to navigate in this geometry, something which is not possible without access to the structure information.

In many cases, suppliers do not as yet use a PDM system which would enable them to import and manage this information. One alternative would be to use a lightweight tool such as PROSTEP's PDM Editor, which allows PDM data files in STEP or XML format to be handled without any need for a supplier to maintain its own PDM system. This can be thought of as a standalone product structure browser made available by the shipyards to their suppliers along with the geometry data in order to allow them to incorporate their modules directly in the surrounding geometry. This also enables the automated re-importing of the data into the shipyards' backend systems.

Traceable data exchange processes

Automated data import and export is a key requirement placed on a data exchange platform and should contribute to more efficient communication between the shipyards and their suppliers. At the same time, everyone involved should be able to identify at all times who has received or delivered what revision level of what data and when. For years, manufacturers and suppliers in the automotive and aerospace industries have been using PROSTEP's OpenDXM software product to perform this task and have benefited from a significant reduction in the organizational work associated with data exchange. This solution

Source: Aker Yards

makes it possible to standardize the exchange processes to such an extent that a normal engineer can activate them more or less at the touch of a button without having to worry about the required formats or quality checks.

Alongside automation, considerations such as information security and intellectual property protection are playing an increasingly important role in global development networks. To cater for these requirements, OpenDXM has been extended by the GlobalX collaboration platform, which allows for the rapid, secure and reliable exchange of bulk data over the Internet. The data exchange platform can be set up with little customization effort in the DMZ (De-Militarized Zone) outside of a company's firewall, which means that companies no longer have to give suppliers access to their intranet. So-called agents allow users to place their data in the portal and retrieve provided data from it automatically.

Although the collaboration platform is suitable for the provision of countless different documents, it was primarily designed for the asynchronous exchange of large data volumes across long distances. This is particularly important for shipyards which have to handle mountains of data as projects draw to a close. The security of the provided data is ensured by the fact that it is encrypted and protected against unauthorized access by a public key infrastructure when it is uploaded to the platform.

Moreover, publish and subscribe mechanisms permit version control of the published documents, thus fulfilling an important requirement in the shipbuilding industry. Change management is one of the most important challenges in the shipbuilding process since designs change frequently even once the ship is already under construction. As a result, it is constantly necessary to create and exchange new documents. At present, the changes are often not communicated based on the 3D model but by means of corresponding comments in the drawings, as Dr. Grau explains.

There is no doubt that the document-based communication of information continues to play an important role in the shipbuilding industry, in particular in the cooperation with the classification companies which are responsible for checking and approving all ship-related documents. Dr. Grau therefore sees a big advantage in the use of tools such as Adobe Acrobat 3D, which can be used to combine 3D and 2D data in PDF documents and lock their contents to protect against modification or reproduction. "The provision of operating and maintenance instructions, which run into thousands of pages of paper, could also be organized more efficiently in this way. The shipping companies could make much better use of the embedded information from the 3D PDF documents and then re-use it for planning their maintenance processes," stresses Dr. Grau.

When it comes to designing more efficient communication processes in the shipbuilding industry, there are many possible approaches and types of solution. It is up to the companies involved to set their priorities, knowing that they can call on the support of expert partners. -we-

PROSTEP AG, Darmstadt, Germany
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Source: Aker Yards

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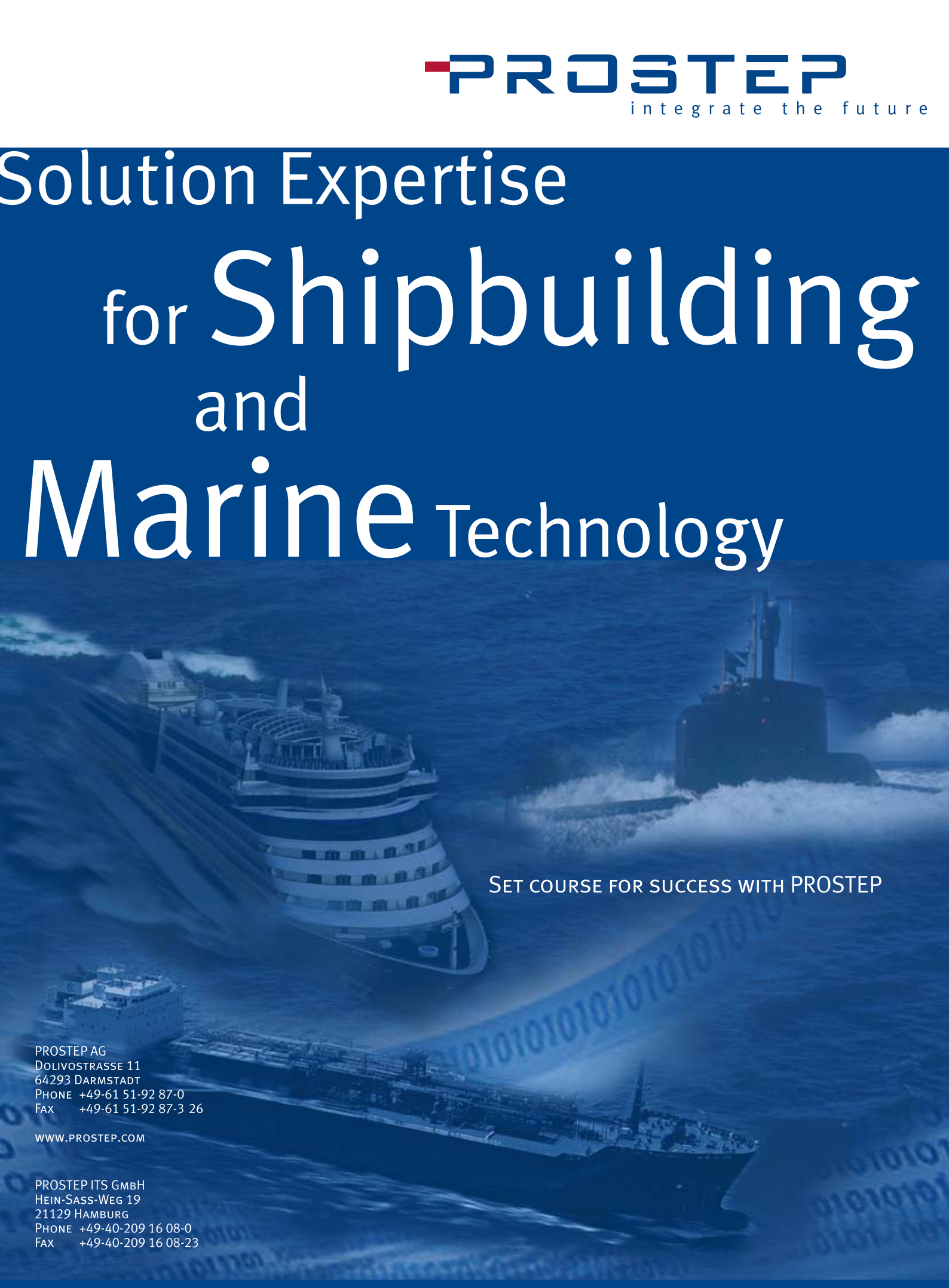

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