

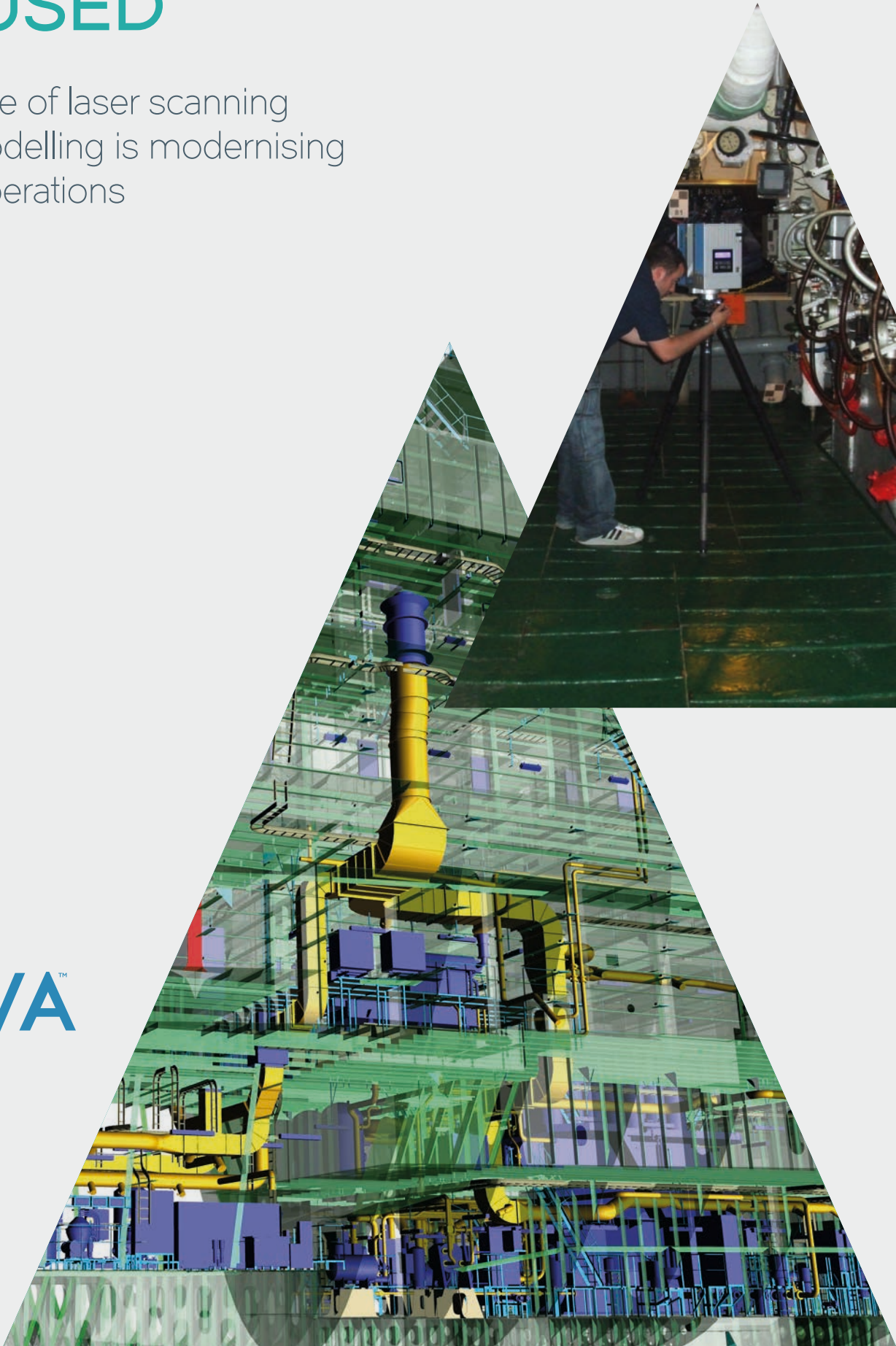
LASER FOCUSED

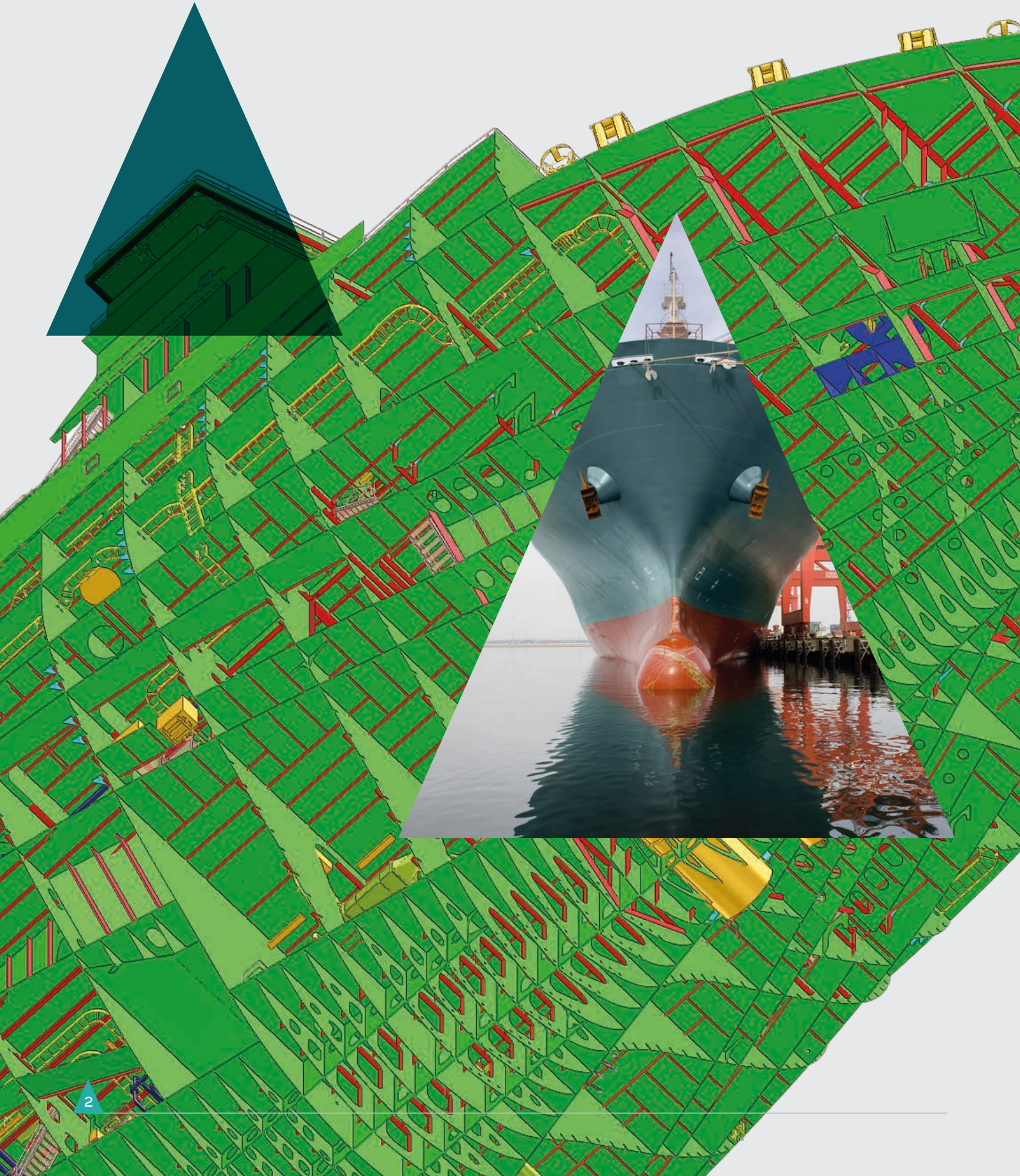
How the use of laser scanning and 3D modelling is modernising shipyard operations

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TIME TO TRANSFORM

Shipyards around the world are going through some of the greatest changes seen in a generation. Challenging market conditions are forcing shipyards to become smarter. The use of technology, such as 3D laser scanning, is helping them to achieve unprecedented efficiencies and give them competitive advantage on the world stage. Here, we explore the challenges facing shipyards, why current ways of working are unsustainable and how technology holds the key to achieving thriving ship maintenance, retrofit and conversion projects.

The shipping industry has faced two decades of difficult market conditions. The global downturn has seen profit margins dwindle and some companies go out of business altogether. It has become a buyers' market where global competition is fierce.

New legislation, such as the IMO Ballast Water Management Convention, which is due to come into force globally from 2019 will see many thousands of vessels needing to be retrofitted with treatment systems* while the 2020 IMO Global Sulphur Limit may necessitate the installation of exhaust gas cleaning systems or LNG conversion.

The cost and associated risk of ordering a new vessel in the current economic climate is causing some owners to extend the life of their existing vessels, contributing to the decrease in new vessels being built. This, combined with the requirement to retrofit vessels, so that they comply with the new legislation, is opening opportunities within maintenance, retrofit and conversion projects.

* Source: Clarksons Research Service

Ship owners and shipyards alike know they need to minimise the time vessels are in dry dock and out of service. In the drive to achieve greater efficiencies, traditional, labour-intensive ways are becoming unsustainable. A fresh approach is required. In short, shipyards need to work faster and more productively.



TIME TO GET SMART

Whether placing new equipment in an existing space or stripping and refurbishing an entire vessel, the starting point for any retrofit project is always the as-is condition of a vessel. Even if the original 3D data model used to build the ship is still available, it is unlikely to depict the as-operated configuration.

Surveying by hand can be costly, time consuming and of limited accuracy. It can usually take place only once the ship is in the dry dock, adding to the duration of the project. There is always the commercial risk that it may turn out to be more difficult than was estimated.

A typical refit might involve a survey team visiting the vessel several times for measurements and other details. The process involves marking everything up, checking, measuring, re-checking, contextualising and then checking again, so that the team can leave the ship with the maximum degree of confidence in the accuracy of their efforts.

The time and manual effort involved, most particularly at refit, can add considerable cost to the project. Refit and conversion or renovation projects are not simply cosmetic works; they take time and are costly. The impact on an owner can be huge. For example, if a platform supply vessel day rate is US\$17,300 per day, and the vessel remains out of service for three months, lost revenues would exceed US\$ 1.5 million. It is equally important for the naval sector, not to have vessels out of service, as smaller national fleets suffer a greater loss of effectiveness when a single vessel is out of service.

There is therefore a strong case for making laser surveying of an entire vessel an integral aspect of its life cycle management. For existing vessels, it offers an efficient means of capturing accurate and up-to-date records of their as-operating condition.

The shipbuilding industry is already embracing new, more efficient ways of working, particularly by using technology such as laser scanning and 3D modelling, but the ship refit and maintenance sector has been slower in the uptake and continues to favour the traditional, labour-intensive processes.

The shipyards need to get smarter to gain a competitive advantage because ship owners are looking for fast and accurate refit, retrofit and conversion projects.



The intelligent shipyard

Technology is transforming how shipyards operate by providing them with unprecedented digital data that is free from human error and streamlines the entire retrofit process, making projects simpler, quicker and more cost-effective.

With 3D laser scanning and capture, the surveying process is rapid, accurate and non-invasive and can be carried out even before the ship arrives in the dry dock. The early availability of such detailed and accurate 3D surveys and the ability to reference this data within the 3D design system enables design and fabrication work to be carried out with confidence, ready for the ship's arrival.

The refitting itself can then be performed quickly and efficiently, minimising costs and out-of-service time for the ship owner. The repair yard, in turn, benefits from reduced commercial risk and increased competitive gains.



HOW LASER SCANNING WORKS

A laser scanner generates a 'point cloud' of 3D points that form an extremely accurate and photorealistic 3D rendering of the objects within its 360° field of view. Such a survey is typically accurate to within a millimetre, over distances of several metres; more than adequate, for even the most detailed refit.

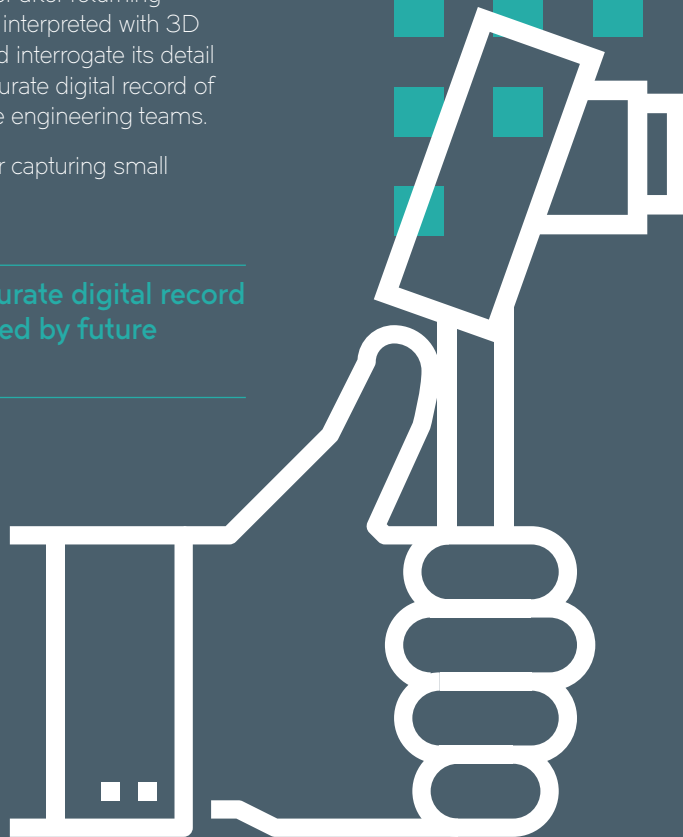
The scanning process is repeated from several locations and the resulting point clouds are stitched together creating a comprehensive 3D survey, combining views from different directions and overcoming the masking of items by foreground objects in any individual view.

The laser scanner also measures the intensity of the reflected beam and can distinguish between surfaces with different levels of reflectivity caused by colour or surface texture.

Scanning provides the ability to retrieve data and pull measurements after capture, in the field or after returning from the ship. When the final images are interpreted with 3D software, designers can see the asset and interrogate its detail with complete accuracy. It creates an accurate digital record of the ship which can be accessed by future engineering teams.

Hand-held laser scanners are suitable for capturing small areas and pieces of equipment.

Laser scanning provides an accurate digital record of the ship which can be accessed by future engineering teams.



Being able to continually scan and update projects and share intelligence directly within the 3D environment offers possibilities for collaboration across projects and assets alike.

Laser scans of as-fabricated component parts and as-built or as-is vessels can be used to update the design model and enable rapid and effective correction or accommodation of any non-compliant construction.

Not only can measurements be made and drawings created using the same software that is used for new-built projects, but the new design objects can be created and positioned accurately against the as-is laser models.

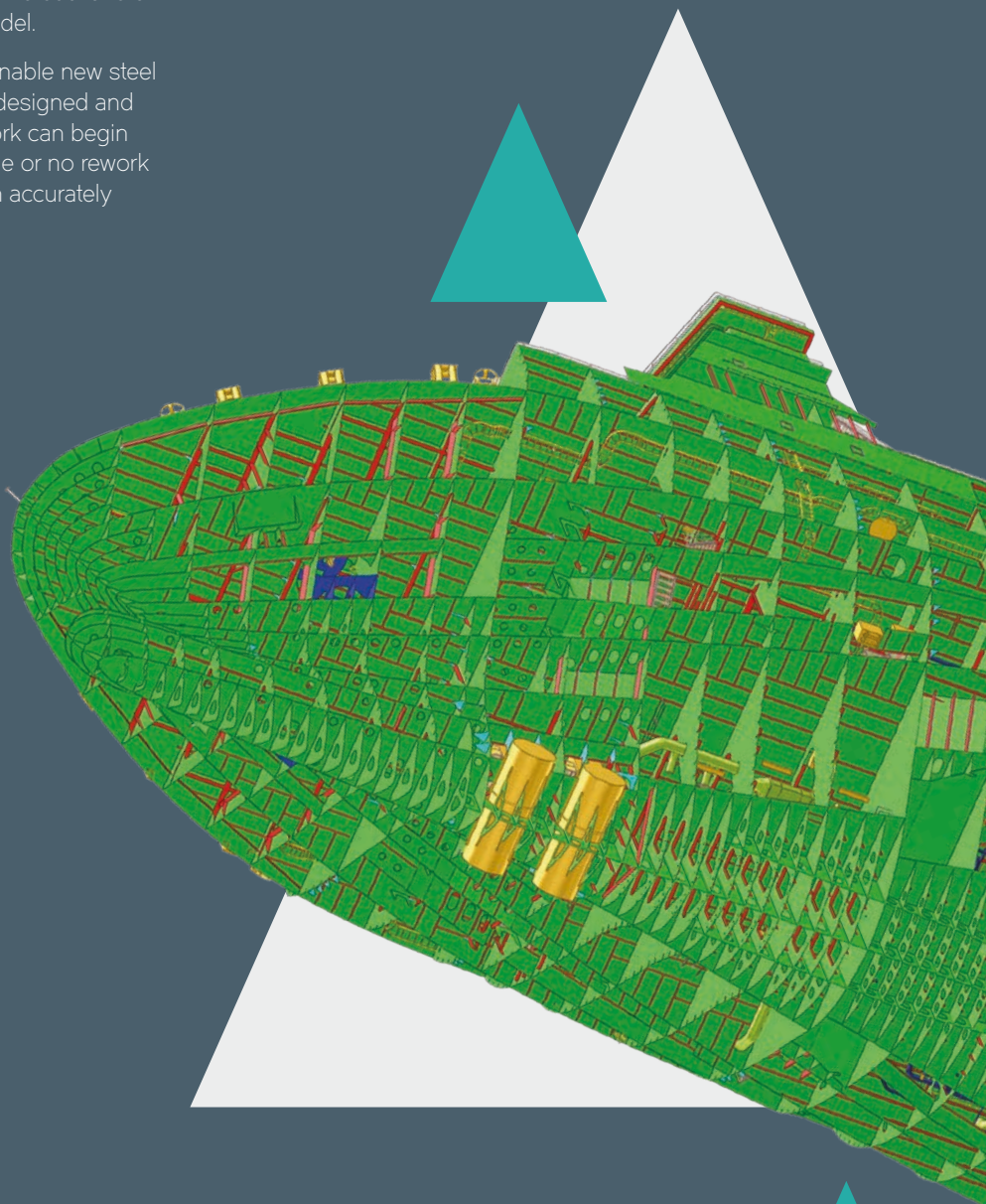
For example, 3D models of new equipment items and their associated pipe and cable routes through an engine room can be created within an accurate 3D representation of the existing structure and equipment in that room. It is possible to visually check the position and accessibility of the new items, while the software's clash-detection functions show any intersections of the new 3D models with the laser scanned model.

Such accuracy, and the confidence it creates, enable new steel structure, pipes, ventilation or cableways to be designed and fabricated ready for the vessel's arrival. Refit work can begin immediately and be carried out quickly, with little or no rework required, because the new items will have been accurately checked against the as-is vessel.

The main business benefits are:

- Quicker projects. Site survey times can typically be halved;
- Higher project quality with accurate survey data;
- Less cost, less downtime;
- Less commercial risk. Retrofit and conversion projects can be tackled with maximum confidence in the as-built model;
- Reduced risk. Hazardous locations can be surveyed safely and quickly.

Such accuracy, and the confidence it creates, enable new steel structure, pipes, ventilation or cableways to be designed and fabricated ready for the vessel's arrival.





Sink or swim

Shipyards need to change to survive. The shipbuilding sector has already shown that embracing technology can deliver transformational benefits.

In the drive to be leaner, faster and more effective; implementing technology such as laser scanning can make the difference between gaining the competitive advantage and being left behind.

3D laser scanning is fast, accurate and cost-effective, enabling shipyards to turn projects around quickly and with world-class results.

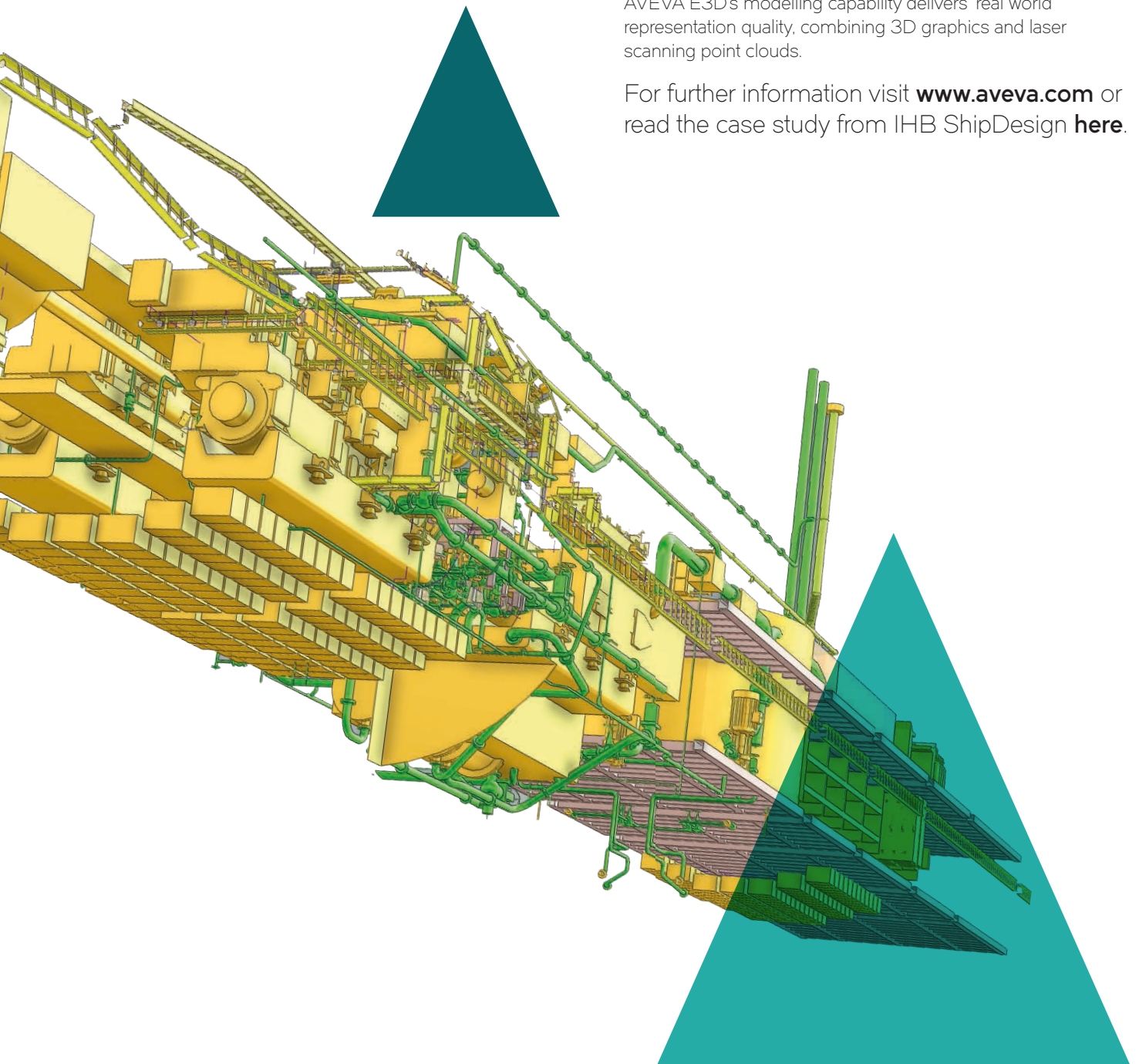
LFM and AVEVA Everything 3D™ (AVEVA E3D™)

AVEVA offers the most powerful, open and innovative solution for processing and consuming laser scan data: LFM is the core technology behind AVEVA's laser solutions.

Advanced LFM technology built into AVEVA Everything3D™ (AVEVA E3D™) enables the use of datasets of virtually unlimited size. It gives the capability to capture the as-is vessel for direct transfer into the 3D environment. Laser scanning is a faster and more reliable method of digitising existing routing and structure on-board with complete accuracy.

AVEVA E3D's modelling capability delivers 'real world' representation quality, combining 3D graphics and laser scanning point clouds.

For further information visit www.aveva.com or read the case study from IHB ShipDesign [here](#).







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