Hull Integrity Advisory Services – Case Studies

Your Hull Consultant in DNV

DNV Maritime

MANAGING RISK

Gaining total control over hull related quality and costs facilitated by your hull consultant in DNV - case studies from DNV Hull Integrity Advisory Services.

As ship manager, hull related quality and cost issues are a major challenge, you need to closely monitor the structural condition of your vessel which is operating in a harsh and hostile environment. As a ship owner, you need to take tough decisions regarding whether to invest in expensive steel repairs or sell and replace with new tonnage. You may also have experienced extensive budget and time over-runs in drydock and see the need to make better docking specifications.

Our VISION is to help ship operators increase safety and create a business advantage by gaining total control of hull related quality and cost issues reducing overall operation costs, increasing availability and differentiating towards competitors and charterers.

DNV Hull Integrity Management is a service that provides ship operators with a practical way of keeping their ships' hull fit for purpose. This is achieved through continuous inspection of the hull condition and easy access to DNV Hull Advisory Services. In this way, DNV can help you create business advantage and reduce your maintenance and repair costs. DNV Hull Integrity Services consists of four service elements:

- Hull Competence training focusing on basic hull strength, structural defects and hull inspection for ship's officers and superintendents
- Hull Inspection Manuals tailored to each ship with unique 3D illustrations identifying what to look for, where to look and how to report the findings.
- Nauticus Hull Integrity easy-to-use software for planning and reporting inspections and maintenance with unique 3D visualization.
- DNV Hull Advisory Services giving you detailed assistance with your hull related issues.

Docking With Cargo

While loading, a container ship was hit by a tug berthing another vessel.
The propeller and turning gear were damaged and the ship had to be dry-docked for further investigation and repairs.
At the time of the accident the ship had about 8500t cargo, 2700t ballast water and consumables on board.
The owner contacted DNV for advice regarding docking the vessel with cargo on board.

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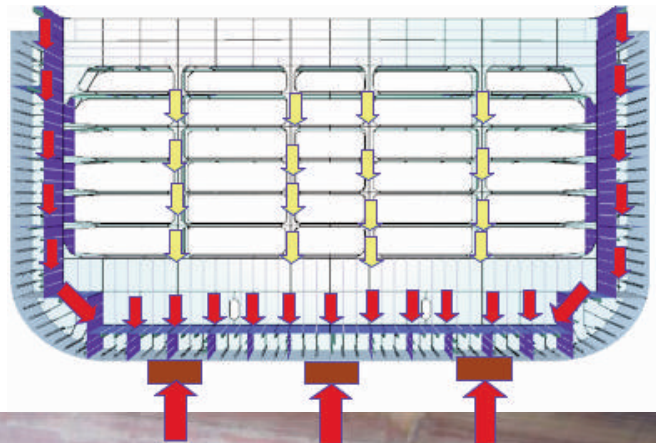
…advised the owner and yard on how to distribute the ballast and how to position the docking blocks to support the vessel based on the detailed loading condition of the vessel.

THE BENEFIT

The owner docked the vessel and completed the repairs with cargo on board. The owner saved a significant amount of time and costs by not discharging and loading the cargo.

Should your vessel need to be docked with its cargo on board due to unforeseen circumstances, DNV can assist with stress calculations and docking plans based on cargo and ballast distribution.



Coating Calculation

A single hull VLCC entered the shipyard for conversion to a Floating Production, Storage and Offloading unit (FPSO) requiring extensive blasting and coating of the ballast and cargo tanks.

The yard's quotation was very high and the owner asked DNV for help.

YOUR HULL CONSULTANT IN DNV…

…calculated the exact coating area based on an existing 3D model of the ship. The results of the calculation proved to be far below the area quoted by the yard which had a substantial margin to cover inaccuracies in their own calculation.

By presenting detailed calculations the owner managed to renegotiate the offer with the yard and to reduce the coating costs significantly.

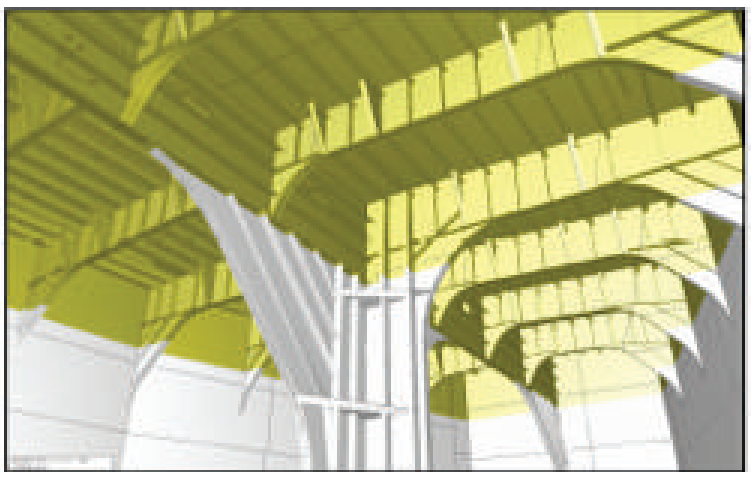
THE BENEFIT

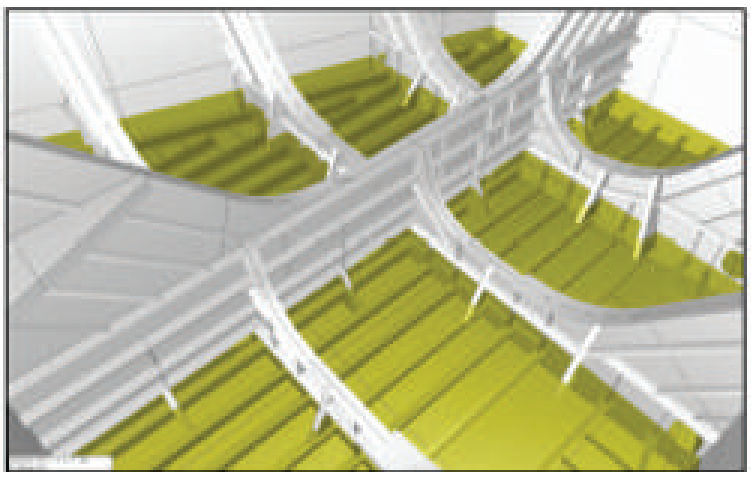
Coating costs are a major factor in the dry-docking budget. Knowing the exact coating area and being in possession of credible calculations strengthens the owner's position when obtaining quotes from the yard and helps avoiding expensive surprises.

For an exact calculation of the coating area a detailed 3D model is needed.

DNV can quickly assist with detailed calculations of coating area to support you in preparing your dry-docking specification.

Details of coating area calculation (from Technical Report)





Lifetime Extension Program (LEP) – Ro-Ro Vessel

The owner of two Ro-Ro vessels obtained a charter for 8 years with option for another 8years.

Although the vessels were already 25 years old, the owner believed that they were in good condition for their age.

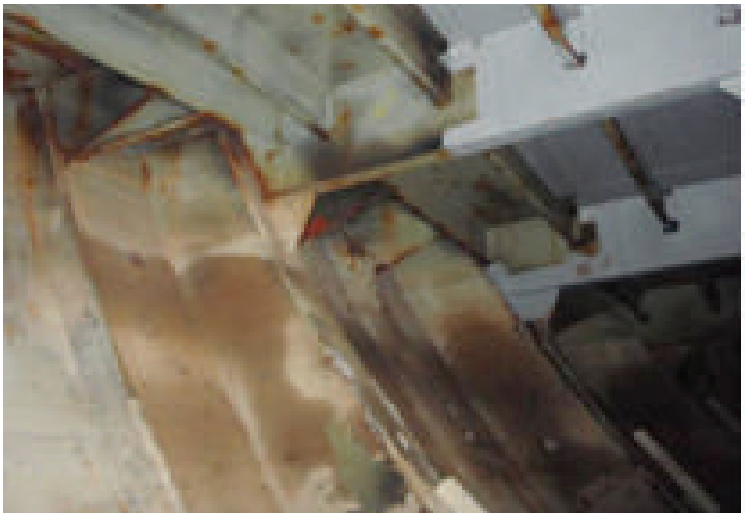
The vessel managers contacted DNV to assess whether or not the good condition of the vessels could be maintained for another 16 years and at what cost. The alternative would be to sell the vessels and replace with new tonnage?

YOUR HULL CONSULTANT IN DNV…

…prepared steel and coating deterioration predictions for different maintenance scenarios, each scenario having its own direct and indirect cost implication. The results were based on a detailed assessment of the current condition of the vessels.

Ship specific Hull Inspection Manuals incorporating an appropriate maintenance scheme were developed in co-operation with the vessel managers.

The vessel managers asked DNV to present the results to the owner's top management.

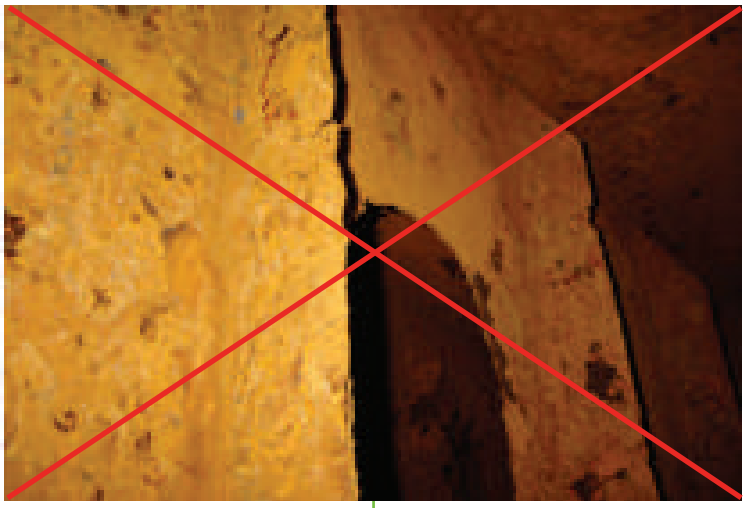


LEP based on present tank condition and maintenance

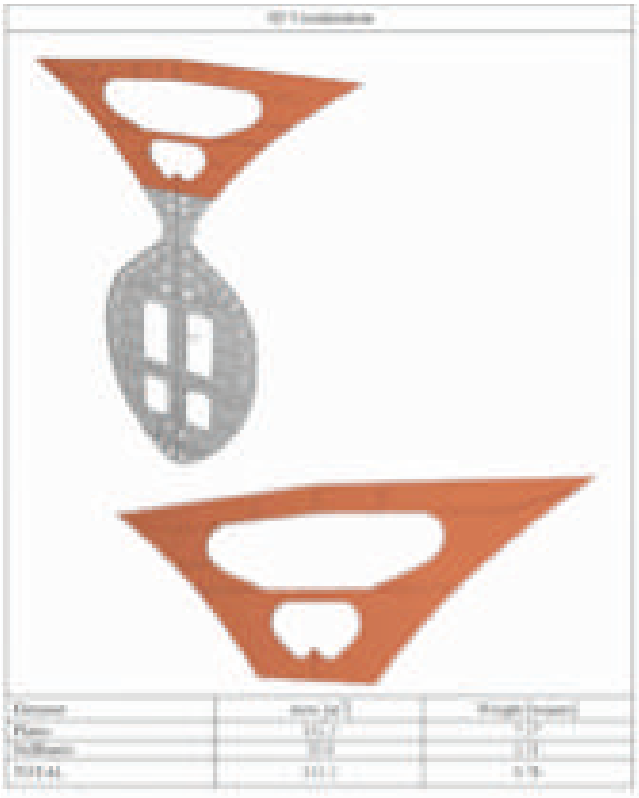
THE BENEFIT

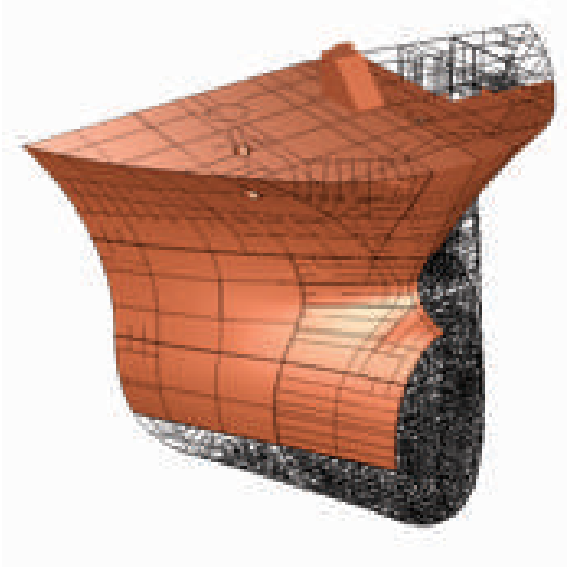
As a ship owner you will, one day, have to make a decision on whether you should carry out extensive repairs, convert or scrap a vessel.

For some owners, balancing income against maintenance and running costs is an art. DNV can provide you with the necessary information to make this strategic decision based on engineering science. Perhaps more importantly, DNV can assist you in developing a sound inspection and maintenance plan to make it happen.



Emergency Repair





An oil tanker was heavily damaged after collision with a container vessel. The vessel had to go to dock for immediate repair. How long would she be off-hire?

YOUR HULL CONSULTANT IN DNV…

…prepared a 3D model of the affected area immediately after the accident.
A class surveyor attended the vessel for a damage survey. By time the DNV surveyor's mark-up sketches were faxed to DNV, the model was ready.

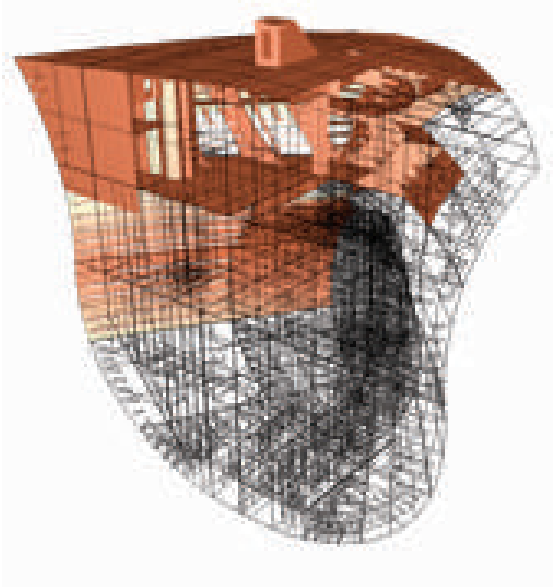
An accurate assessment of the steel renewal weight was made available to the owner prior to vessel's arrival in dry-dock.

The repairs were negotiated and carried out based on DNV's detailed technical report.

THE BENEFIT

When it comes to unscheduled repairs, it is essential to have an accurate estimate of the resulting off-hire as early as possible.

By quickly modelling the affected area in 3D, DNV can provide detailed repair specifications and repair sketches at short notice. These repair plans can often be ready prior to the vessel entering the yard enabling immediate commencement of the repair process. By providing the yard with detailed repair specifications as early as possible your off-hire and repair costs can be reduced to a minimum.



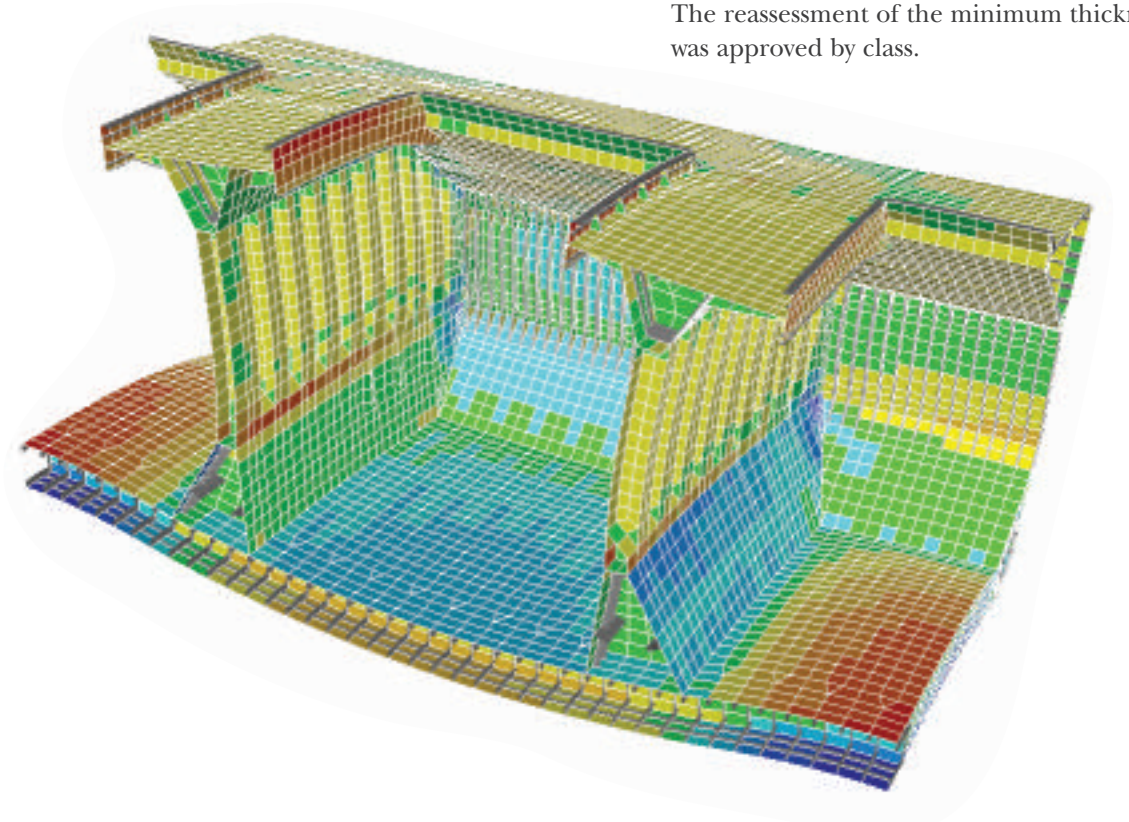
Advanced Strength Reassessment

An 18 year old Bulk Carrier experienced extensive corrosion of the inner bottom plating below minimum thickness limits. The owner faced extensive repairs and consulted DNV regarding possible solutions.

YOUR HULL CONSULTANT IN DNV…

…carried out a reassessment of the minimum thickness requirements of the inner bottom plating. The re-analysis was carried out using state of the art finite element techniques and non-linear buckling theory. Based on the results from direct calculations new minimum thickness limits with higher corrosion margin were given.
The minimum thickness requirements for the double bottom structure were adjusted based on the results from direct calculations.

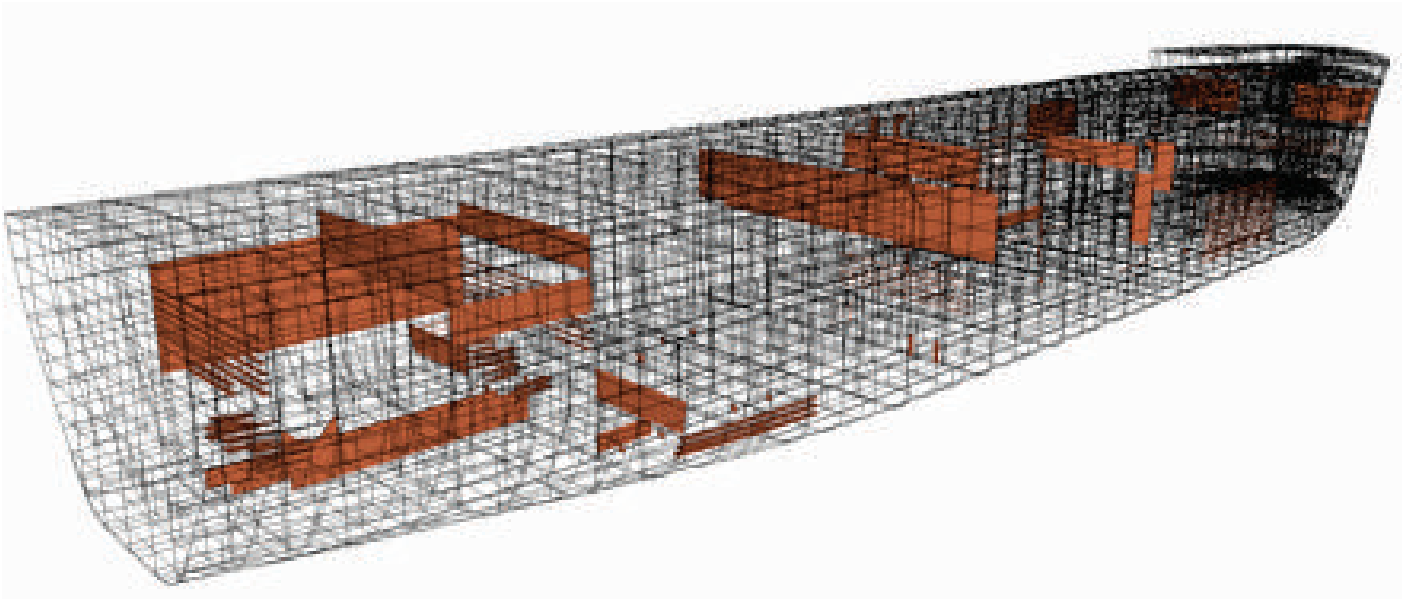
The reassessment of the minimum thickness requirements was approved by class.



THE BENEFIT

When the steel structure of a ship is corroded below the originally minimum thickness limit specified by Class Rules, the steel must be renewed to new-building scantlings. For older vessels this may result in extensive repair work. One strategy can be to reduce the loading on the vessel by reducing the still water bending moment. In the case of bulk carriers the deletion of certain class notations (e.g. for alternate loading) may give a larger corrosion allowance and thereby avoiding bigger repairs.

Lifetime Extention Programme (LEP) – FPSO



To be or not to be - to maintain or scrap, that was the question.

The owners wanted to know the quantity of steel renewal needed to be done in order to keep his 38 year old Floating Production, Storage and Offloading unit (FPSO) operating safely for the next 5 years.

Based on the valuable input from DNV the owner had a detailed overview of the costs and could make a better decision on whether to scrap or not to scrap the ship.

YOUR HULL CONSULTANT IN DNV…

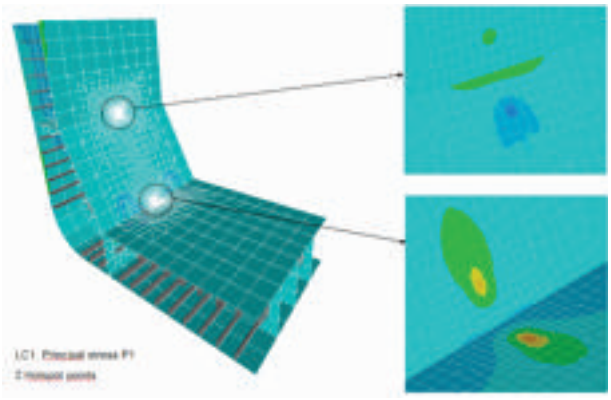
… surveyed most of the tanks while the vessel was in full operation. The methodology for DNV'S Condition Assessment Programme (CAP) was used to evaluate the condition of the steel structure and coating condition. Using the ultrasonic thickness measurements done as part of the normal CAP procedures, the vessel's residual strength was analysed without any steel being renewed. This gave the "as is" structural condition which was then used to create a detailed repair specification for the owner. A slightly updated 3D Model of the FPSO was then used to represent the defective steel structure and used to calculate the steel weight of the recommended repairs.

THE BENEFIT

The information supplied by DNV assisted the owner in making the important financial decision on whether to keep or scrap the vessel. The owner had a better understanding of the scope of renewals and could then better plan for the docking, saving time and money at the repair yard.

Fatigue Calculation

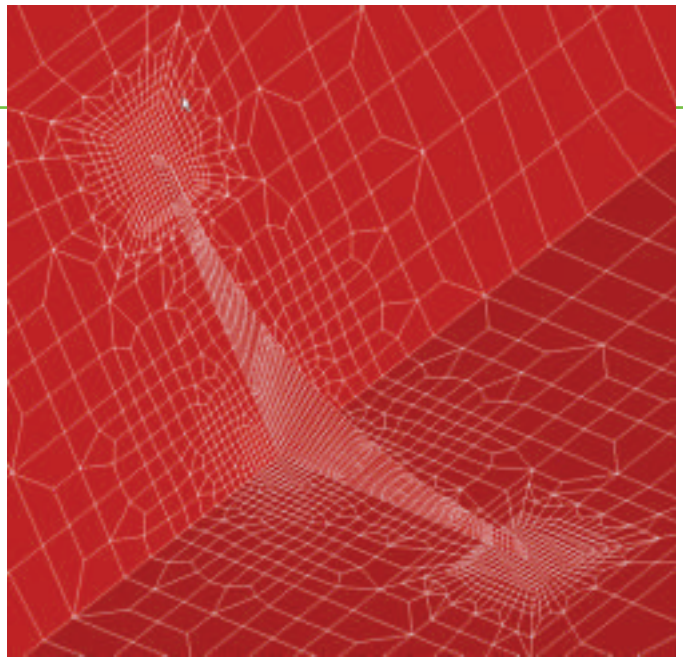
A 10 year old oil carrier experienced cracking in the lower hopper knuckle. The ship was built with a design life of 20 years. DNV was asked to check the fatigue life in the hopper knuckle detail and to suggest possible design improvements.



YOUR HULL CONSULTANT IN DNV…

…prepared a 3D model of the cargo hold and hopper knuckle. During the fatigue assessment the original design was evaluated and results showed that the fatigue life of the lower hopper knuckle was below the fatigue life of the vessel.

To strengthen the design a bracket was added. Re-calculation showed a doubling in the fatigue life of the lower hopper knuckle.



Mesh of the bracket reinforced lower hopper knuckle

THE BENEFIT

Oil majors often require a fatigue assessment in combination with a Condition Assessment Programme (CAP) before chartering a vessel. DNV may carry out fatigue assessment for the whole ship or a certain detail. Improving a certain structural detail will have a positive effect on the fatigue life.

Hull Integrity Implementation Support

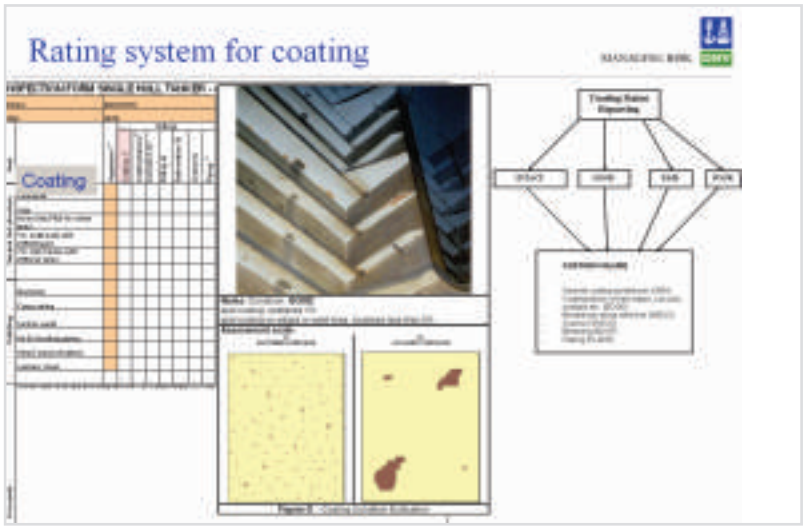
One of the world's biggest tanker operators signed a contract for Hull Integrity Management (HIM) on five VLCC tankers.

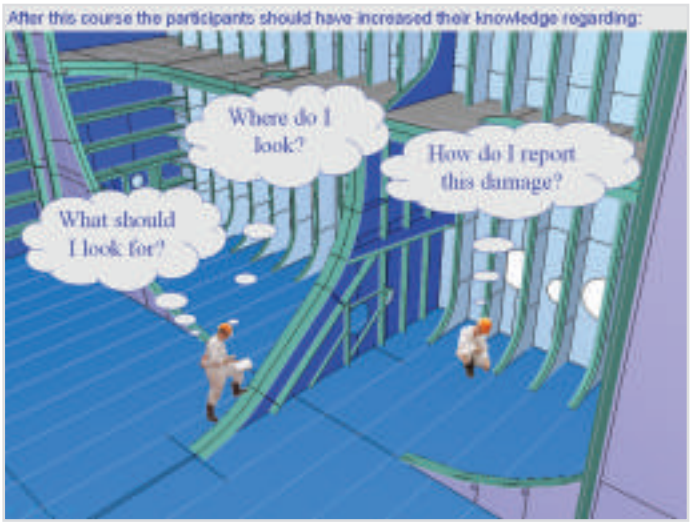
DNV delivered training courses, Hull Inspection Manuals and Software. Since it is not an "off the shelf" product it is important to ensure that tool is implemented properly and used efficiently by the owner.

YOUR HULL CONSULTANT IN DNV…

…set up a plan together with the owner to attend all vessels for implementation of HIM on board.

- Installation and training of crew on board
- Joint inspection and data input on board
- Integrate HIM to the company's planned maintenance system





THE BENEFIT

HIM is fully implemented onboard all the ships. The crew gained confidence in performing tank inspections and the superintendents use the reports towards the vetting inspectors and charterers to prove compliance with the Tanker Management Self Assessment (TMSA) requirements. In addition the owner found this tool to be practical support for his hull maintenance support.

Nowadays the owner is using DNV's HIM for profiling his company towards oil majors and the owner signed HIM contracts for all his vessels classed with DNV.

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We welcome your thoughts!

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