GL Maritime Software

# Using innovation to improve operational strength and reduce operational costs

Tanker Operator Conference

Athens

03 April 2013

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# How are you?

## No, I mean...

# How are you doing?

## What I really mean is...

# How is your business, your fleet doing?

Performance

## But the real question is...

# Do you know?

**- And if you do, how much time and effort does it cost you?**

# Making money in a tough market

Main Topics

**(How) Can you improve operational strength and reduce operational costs at the same time?**

**Presentation topics:**

- The role of innovative technologies
- The case for investing in innovation even in tough times

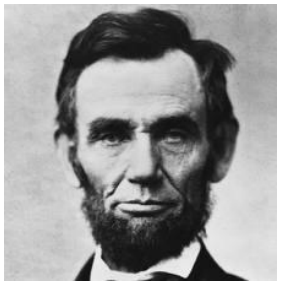
**Examples:**

- Digital 3-D structural models to support ship operations
- CFD-based simulation and hydrodynamic computational models in ship operations
- Integrated information evaluation to enhance operating economy of vessel

# The right tools for the job

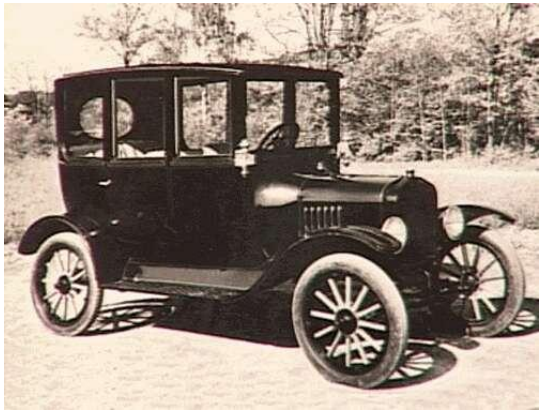
***"Give me six hours to chop down a tree and I will spend the first four sharpening the axe."***

\- Abraham Lincoln (US President, 1861 – 1865)



- Using the right tool enables you to accomplish more, with better accuracy, using less effort
- Why not use innovative IT technology to make things easier
- Software technologies and systems exist that can significantly ease the burden on the crew, and automate data collection, processing and reporting, protect your assets, save costs, and reduce risk
- **The result:**
  - It is easier to do the task (e.g. collect and report data)
  - The potential for human error is significantly reduced
  - You have a much better basis (increased transparency) to use information comprehensively over the lifecycle of the ship to boost competitiveness

# The principle about software: first understood long time before computers existed



Ford T-Model: 60% market share and undisputed competitive advantage for over two decades

**Henry ford did not:**

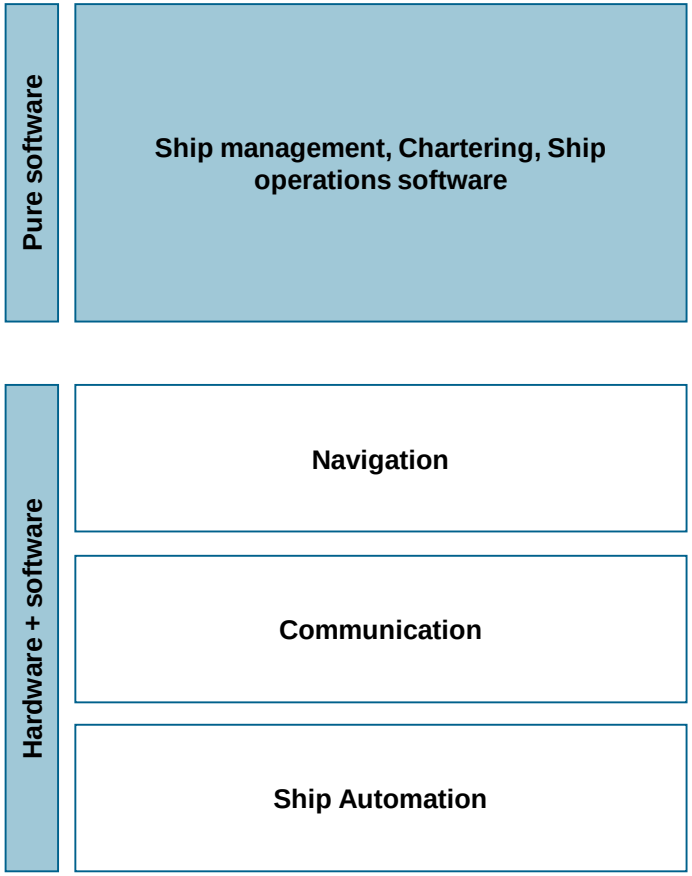
- invent the car
- invent the assembly lines

**the only thing he did (quote):**

„…we have put a higher skill into management, planning and tool building“

# Software: one of the technology segments in shipping – underinvested in the past

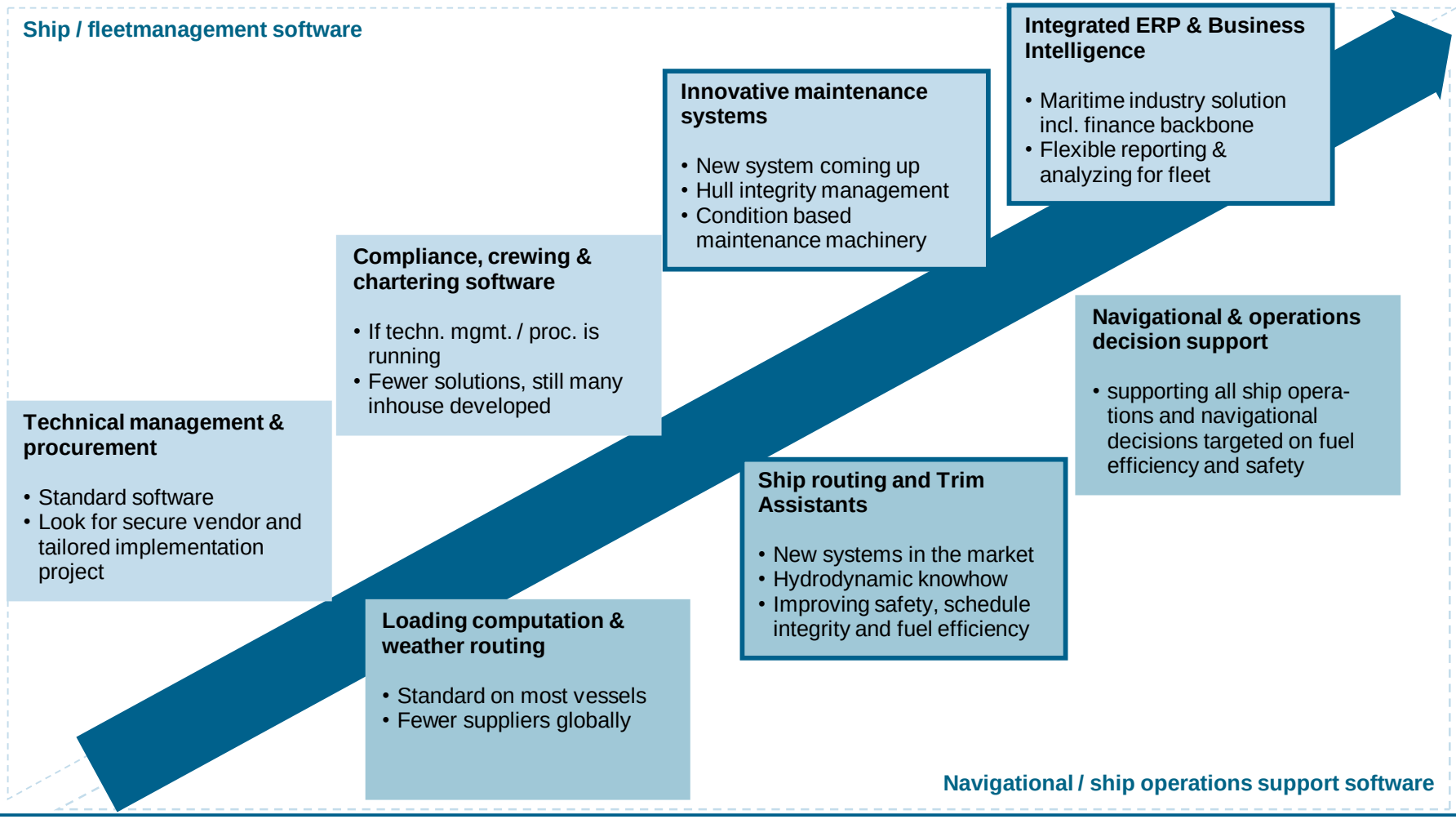
## Market segmentation




## Investment level

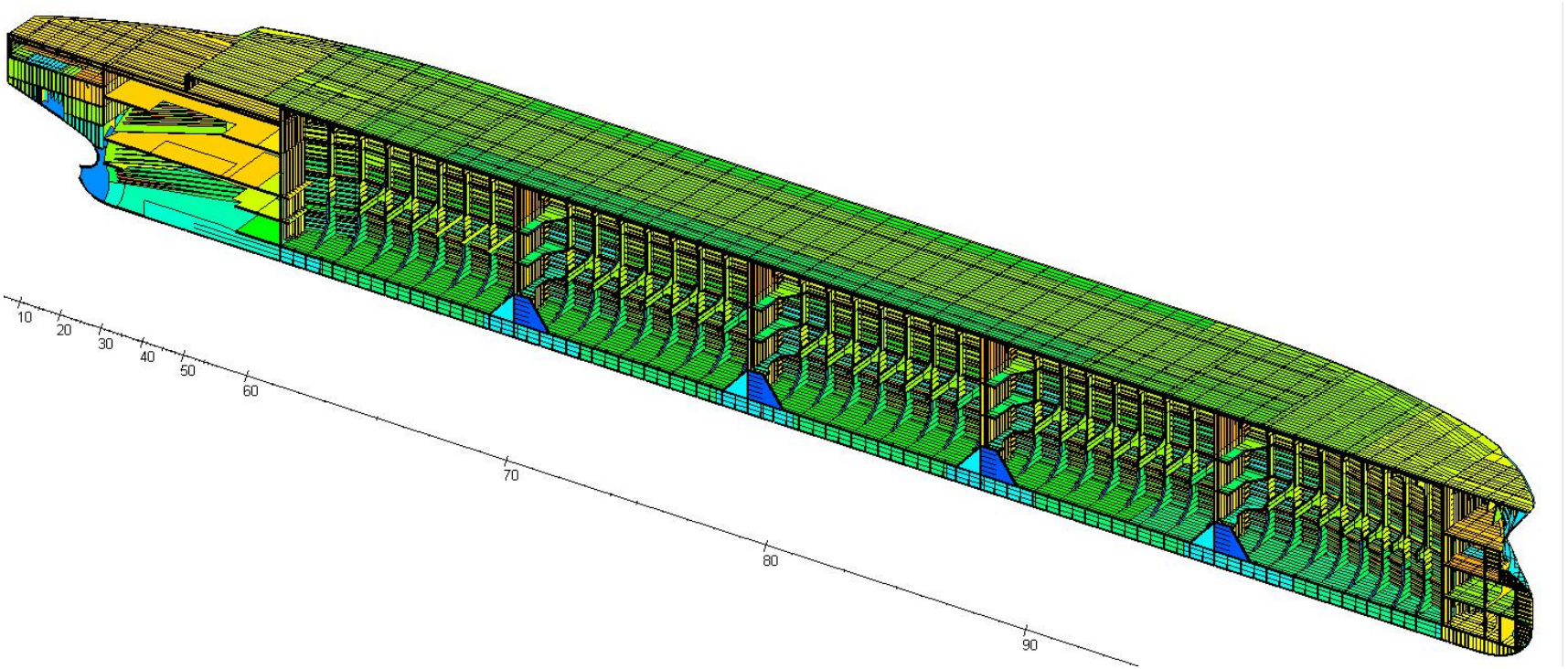
- Compared to the annual investment in new ships (~100bn€) the 700m€ software spend is only 0.7%
- The Oil & Gas industry invests 12bn€ in software p.a., which is compared to their CAPEX (~340bn€) apx. 3.5%
- **investment level in shipping in software is only 20% compared to Oil & Gas industry**

# How high performing shipping companies utilizing software: a typical roadmap



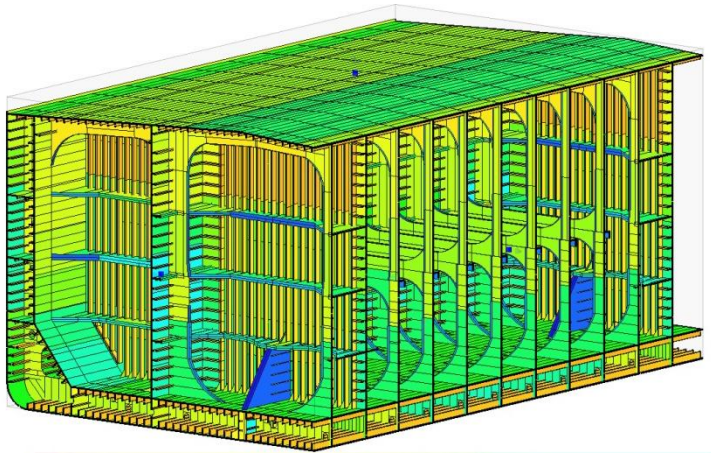
# Use of digital 3D models to support ship operations

- For many years digital 3D models have been used successfully in ship design phases.
- How can digital 3D models help in ship operations?
- Harnessing modern IT advancements:
  - Make 3D data from construction phase usable in subsequent ship operations
  - Tools for effective interaction with model?

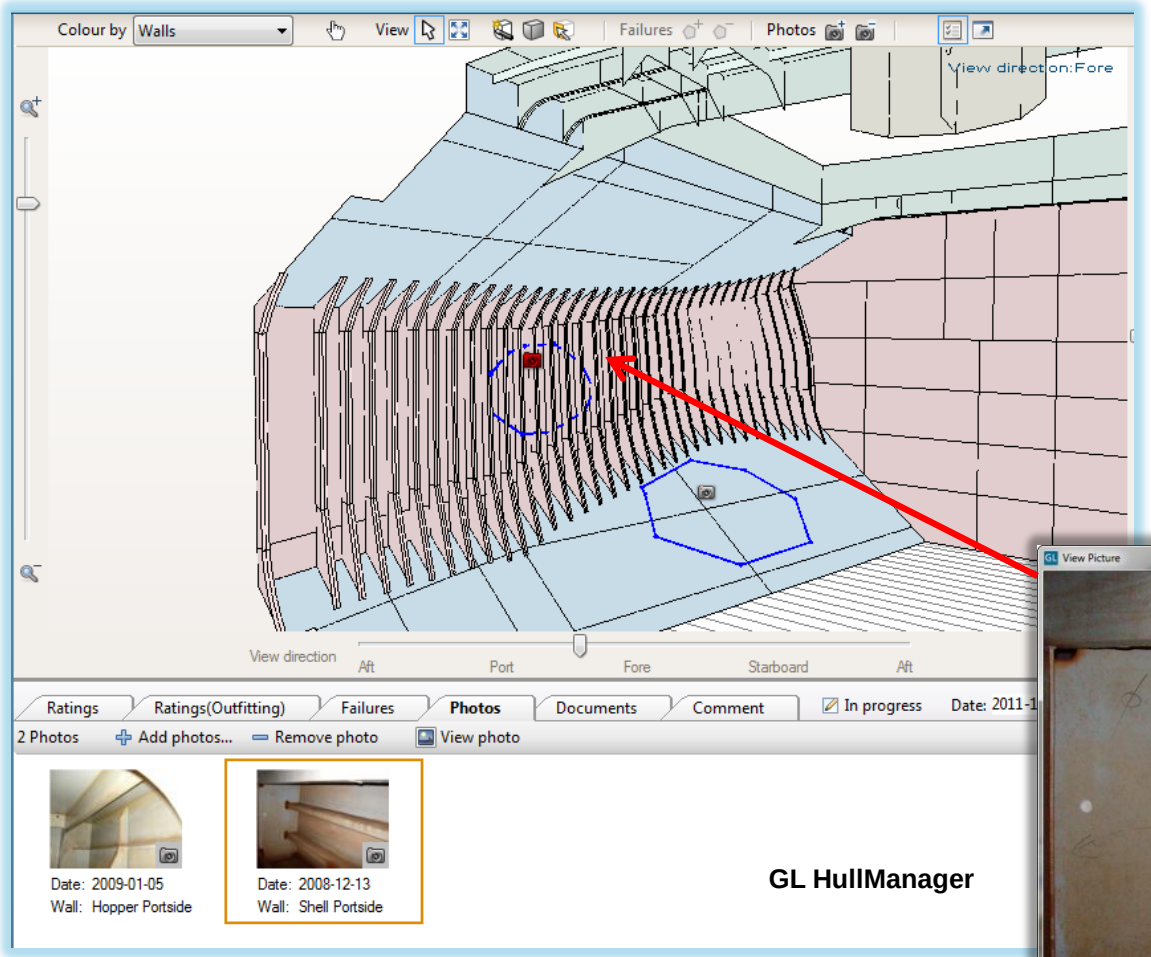


# Benefit of using digital 3D models to support ship operations (1)

- In a 3D model you can navigate, perform measurements, calculate values, and display, select, filter, localize and annotate objects
- Use information gathered over whole lifecycle of ship
- Increased transparency of condition monitoring
- Improve communication between various actors
  - ship's crew, onshore staff, external 3rd parties



# Benefit of using digital 3D models to support ship operations (2)

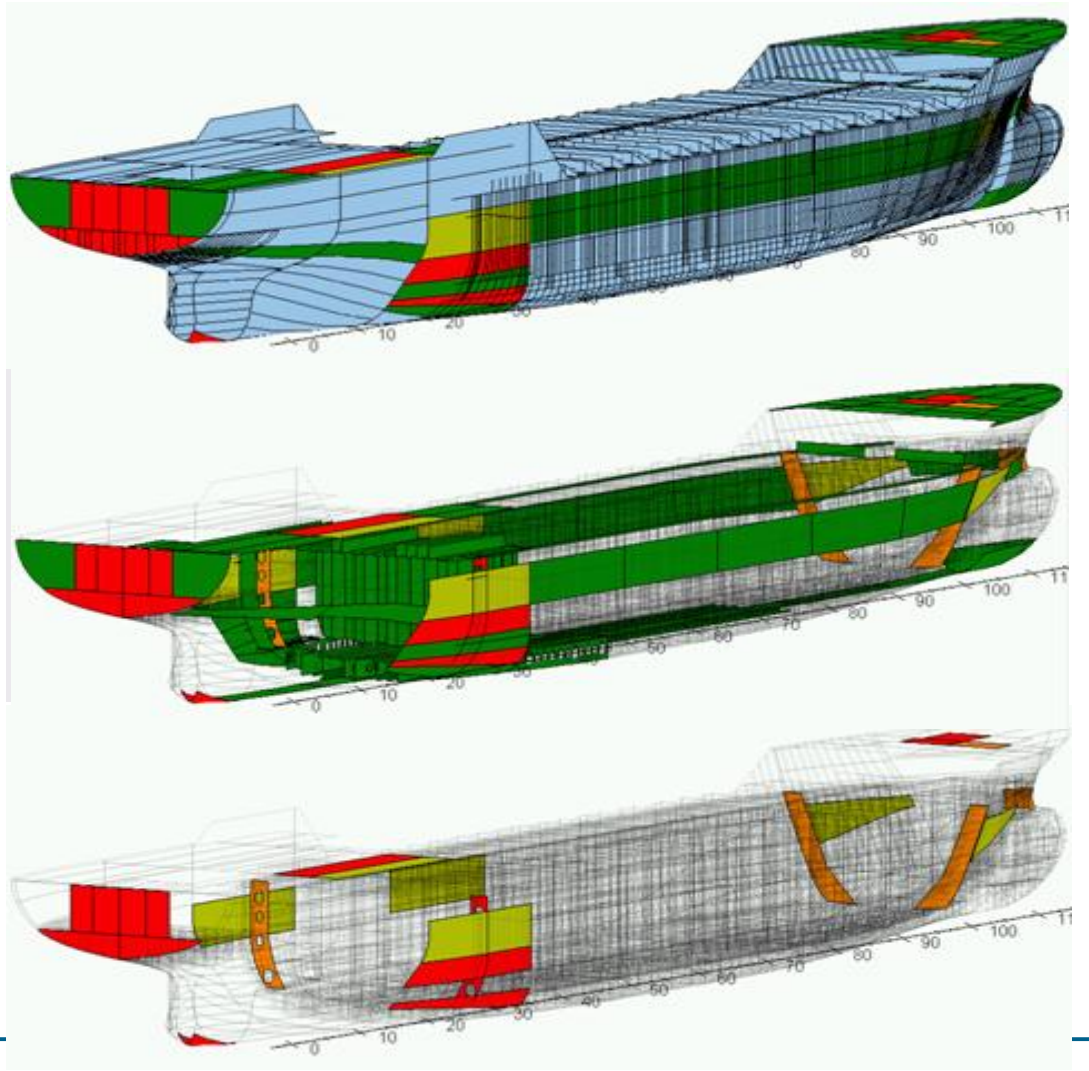



**GL HullManager**

- Easily assess condition data of ship
- Capture critical data, e.g. damages, for easier access, evaluation and tracking over time
- Better description with 3D model – no ambiguous terminology
- More accurate position description
- Comprehensive assessment platform for visual inspections and TM data

# Benefit of using digital 3D models to support ship operations (3)

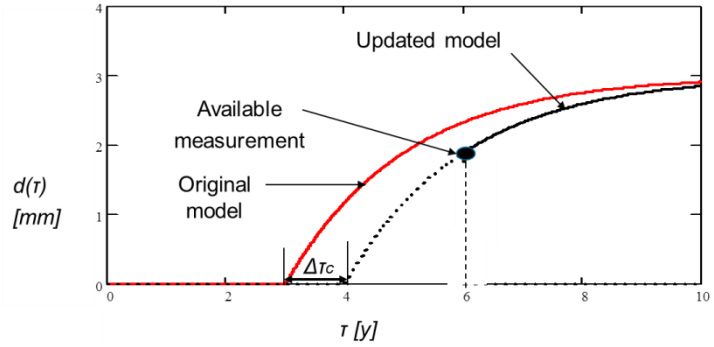
- Better manage large volumes of data e.g. from thickness measurements
- Better obtain overview of condition: graphically or statistically, for sections, compartments or elements
- Better planning of repairs and steel replacements
- **Cost savings**

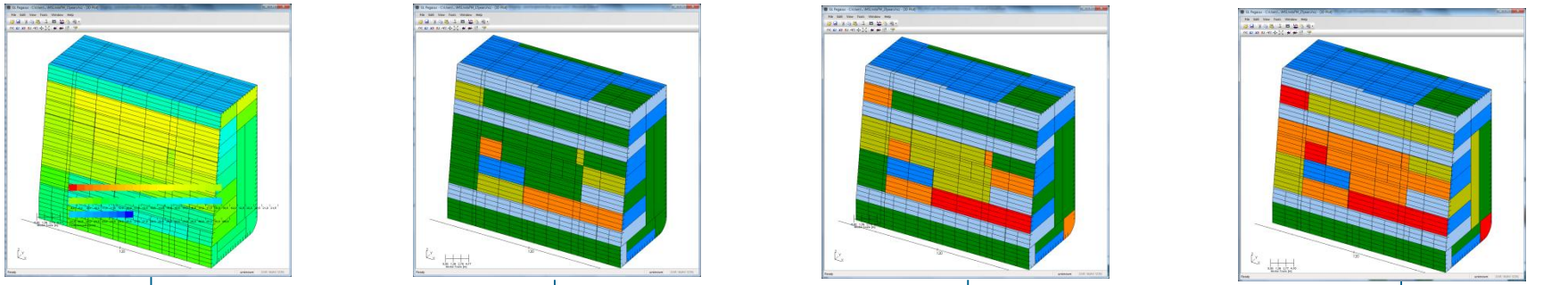


Fast overview of degradations and elements to be renewed

# Benefit of using digital 3D models to support ship operations (4)

- Use historical and current data to make forecasts / predictions, e.g. of future corrosion rates



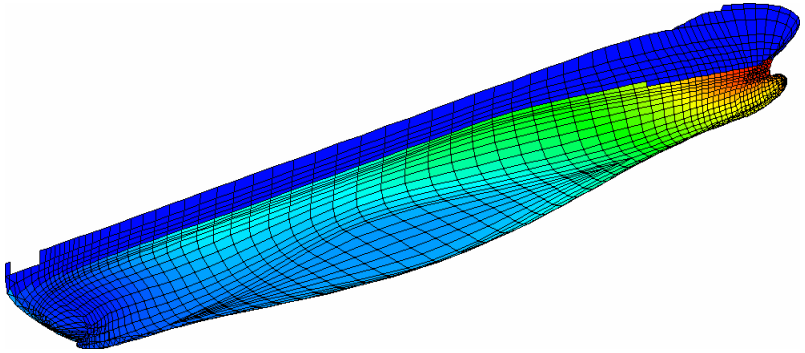



# A different type of modelling – CFD simulation

- In recent years, computer power has advanced to allow CFD simulation to solve many challenges
- Similar to structural 3D models, CFD “modelling” is often used in the design phase
- CFD simulations and hydrodynamic computations can be used for many applications
  - Predicting propeller – rudder loads and cavitation
  - Predicting shallow water effects, squatting
  - Predicting loads on structures
- So indeed, CFD and hydrodynamic computations also can be applied to ship operations
- How? It takes tremendous computational power to run such simulations.
- The trick is to make pre-compiled hydrodynamic database covering relevant operational spectra available in **onboard decision support systems**

# How to / Why use CFD-based simulation and hydrodynamic computations in ship operations?

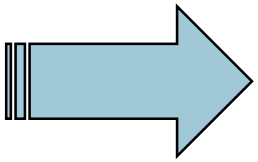
- Maybe in your SEEMP you've identified some efficiency measures, e.g.
  - Improved voyage planning
  - Weather routing
  - Speed optimisation
  - Trim optimisation
- But why not increase the value by adding in the seakeeping behavior of your specific vessel?
- The seakeeping behavior of your vessel can be very accurately predicted with hydrodynamic computational models



# How to / Why use CFD-based simulation and hydrodynamic computations in ship operations?

**By applying computational models (thousands of simulated "trials") taking into account**

- sailing conditions
  - speed
  - heading
- geometry of the hull
  - shape
  - trim & drafts
- ship weight
- environment
  - waves
  - wind
  - confined waters
- physics and properties of the water
  - free surface (wavy surface)
  - density
  - viscosity



**We can predict seakeeping performance**

- Vessel motions and accelerations at any position onboard in 6 DOF
- Dynamic stability
- Global design loads, sectional loads and stresses
- Local loads, e.g. Slamming, pressures on the hull
- Sloshing

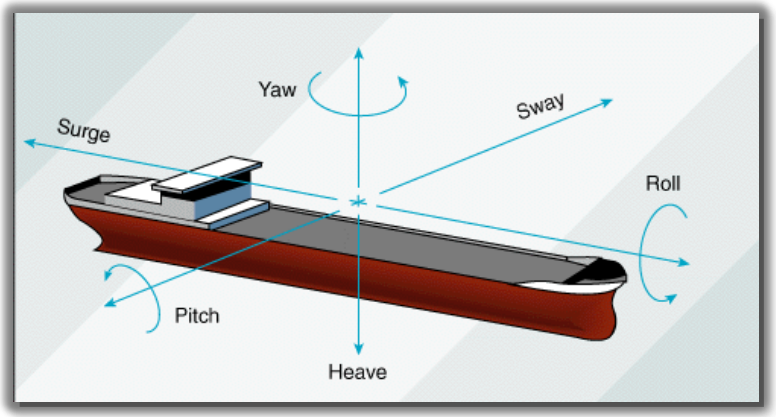
**For the benefit of:**

- Risk reduction
- Safety and Efficiency
- Finding / setting limiting conditions

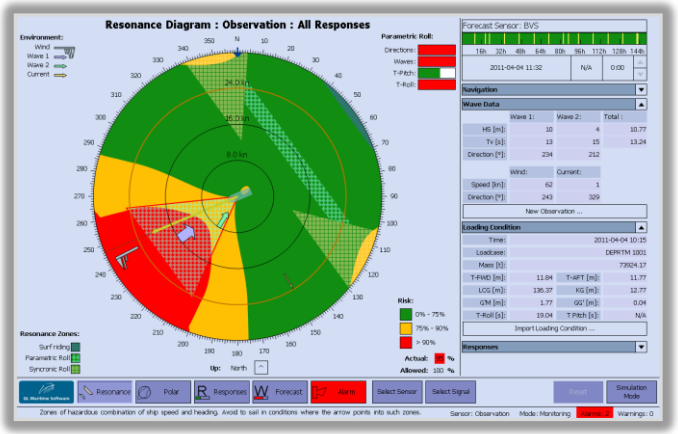
# And make it available in an onboard decision support system

GL SeaScout is an integrated on-board system that provides ship's officers with decision-making support.

- Link NMEA data (speed / position / course), route, weather / seaway, load case / tank fill, hydrodynamics / seakeeping behavior
- Inform ship's officers of how the ship is responding to current or upcoming conditions
- Better balance safety, voyage efficiency and schedule integrity
- Improve vessel lifecycle performance by avoiding seaway / weather related damages (slamming), and heavy structural stress




**GL SeaScout:** ► The central display allows navigators to easily identify risks with intuitive presentation of alarms / dangers



# Benefits of seakeeping on top of “just” weather routing for improved voyage optimization

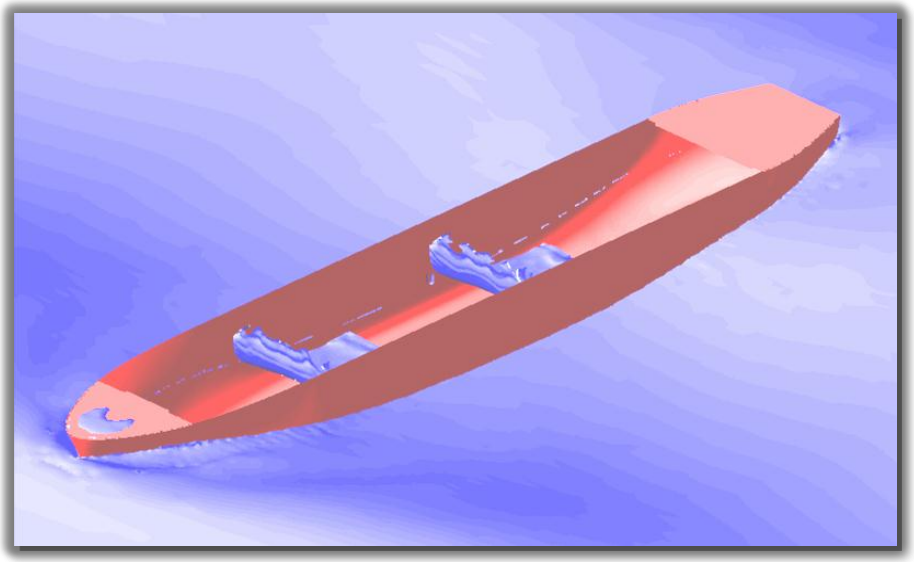
With an onboard decision support system such as GL SeaScout:

- More exact information about your specific vessel’s behavior (weather routing alone does not know your specific vessel and how it will behave in different conditions)
- Knowing the load case / mass distribution / tank fill level (weather routing does not know this)
- Weather routing gives a „conservative“ route, avoiding limiting criteria (e.g. avoid sea states with waves above 3m)
- GL SeaScout tells you how your vessel will behave when it comes into sea states of e.g. 3 m (or 2 or 4 or 5 or 6 or 7 or 8 ...)
- You can determine exactly what risks heavy seas will pose to your vessel (e.g. maybe it is safe to sail straight through with 5m waves)
- So you can evaluate if it is actually necessary to alter course and determine optimal speed (and sail at more balanced speed profiles – no „sprinting“)

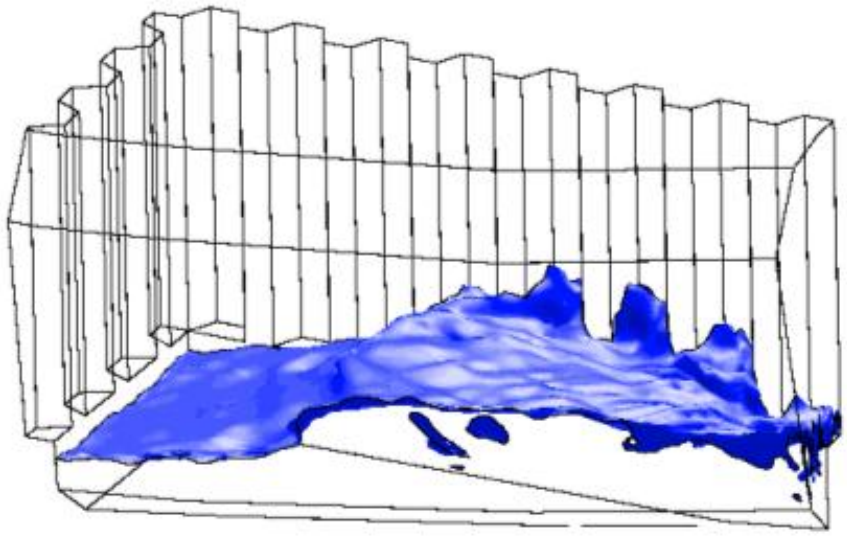
# For LNG Carriers: Using hydrodynamic computations to predict and avoid sloshing occurrence

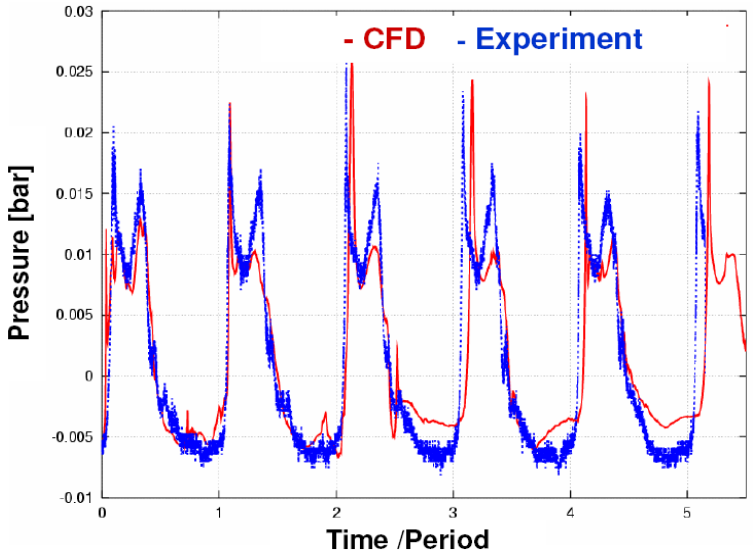
GL SeaScout is a mature and proven decision support system for avoidance of large vessel responses such as motions

- Sloshing occurrence is the result of tank / vessel motion exciting the fluid to excessive motions that are out of phase with those of the tank
- The natural frequency of the liquid is a function of tank motion mode, geometry and fill level
- Modes of motion which can excite the fluid to slosh are generally surge, roll, and / or pitch, all of which are already considered in GL SeaScout‘s computations



# Hydrodynamic (CFD) Computations match up well against validated experimental (measured) data






***Prediction of ship motions and sloshing induced loads in tanks of LNG Tanker***

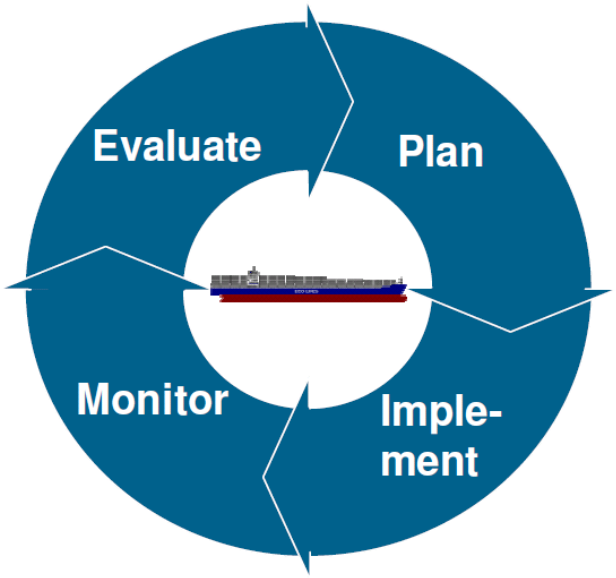
# Benefits of advanced voyage optimization with hydrodynamics

| | | |
|---|---|---|
| 1 | **Reduce Risks** | of navigational incidents in heavy weather / severe seas with all its consequences |
| 2 | **Protect Vessel** | by warning when critical values for structural stress, slamming, **sloshing** etc. are approached |
| 3 | **Protect Cargo** | by predicting / warning of parametric and/or synchronic rolling |
| 4 | **Protect Crew / Passengers** | by reduced likelihood of extreme vessel motion |
| 5 | **Save fuel and costs** | by active route planning, more constant speed profiles, less stresses and repairs |
| 6 | **Please internal / external stakeholders** | by reduced risk, higher availability, and higher schedule integrity, fulfill SEEMP |

# And back to your SEEMP

- **What's important to make it work?**
  - Defining a good baseline
  - Ensuring continuous and good-quality data collection
  - Standardization of monitoring and data collection across the fleet (doing it the same way on all vessel)
  - Don't over-burden crew with increased reporting tasks (use already existing records)
  - Easy (automated) processing of data onshore for evaluation / analysis

Measuring (Planning, monitoring)




Doing (implement energy measures)

This is the case for integrated information collection and evaluation, which you can only achieve with specialized IT systems

# Do you know?

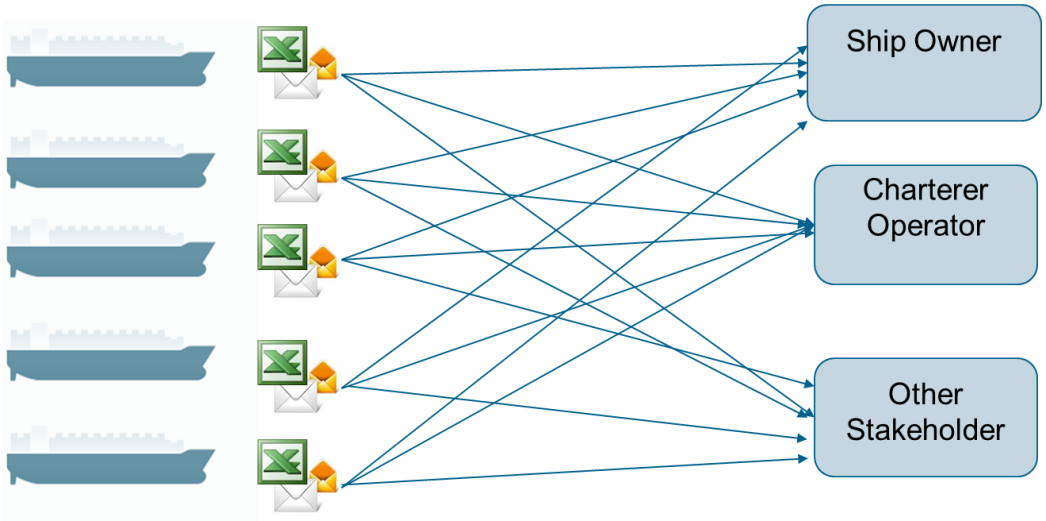
**How long does it take you and with how much (manual) effort can you determine:**

- What was the EEOI as a fleet average vs vessel-by-vessel for Q1 2013 and how did it compare to Q1 2012
  - On ME-Asia trades
  - Only counting ocean legs
  - Only in fair weather conditions
- What were our emissions – CO2, NOx, SOx
  - For the whole fleet
  - For specific vessels
  - As trends or comparing periods year-on-year
  - In port only / At sea only

- **Can you leverage your data – not only for SEEMP – but for better voyage analysis and decision making?**

# There has already been a lot of stuff reported by the vessels

- The fact that vessels are generating and reporting data is nothing new
  - Many reports: Noon, arrival, departure, stoppage, bunkering, bw discharge, voyage log, engine condition .....
  - The contents are largely similar → the same data is being reported redundantly
  - And in various formats: Excel, Email text, Fax, PMS software




- Why make the crew do double work? Why leave the reporting open to error?
- Why make it incredibly difficult to process, analyze and draw conclusions out of all this?

# And a lot of this data could be highly valuable …

**So when new topics / requirements / pressures arise ...**

- SOx, Nox, CO2, EEOI, SEEMP ....

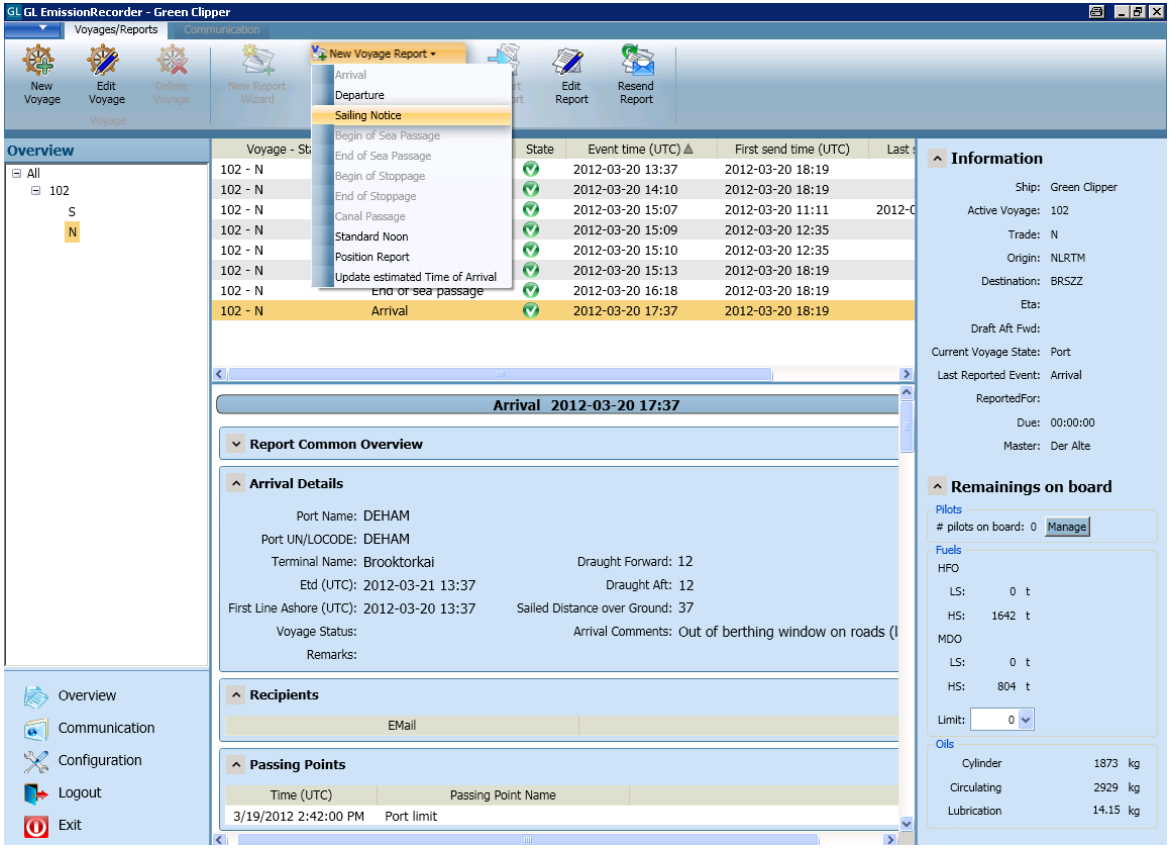
**... If it were more structured and you could use it systematically**

- Fuel consumption, lube oil consumption, speed, position, voyage, vessel, .....

**... The same data could be used to solve new challenges**

# Structured reporting for highest data integrity and low crew burden

- Data entered only once – automatically re-used
- Smart default values
- Guided workflow for reporting
- Plausibility checks (as all reports are linked)
  - e.g. fuel remaining on board against amount bunkered against consumption in daily noon reports....
  - Checks for completeness (e.g. no arrival report of a previous departure report hasn‘t been completed)




GL EmissionManager
Onboard data recorder module

# Simplify data collection, ship-to-shore reporting, and dissemination of data

## Combine the right data collection and reporting methods, data processing

**Data recorder onboard**
User-friendly software interface for crew

**Onshore Server**
Using modern Business Intelligence (BI) technology


Onboard recording of all Emissions and Performance related data

Analysis on shore - for the entire fleet

- automatic processing and dissemination of data to e.g. owner, manager, and/or charterer with tailored content

Concept of GL EmissionManager

# And throw in some BI Technology helps overcome "traditional" problems

- Well, I guess we collect this data but in 10 different formats (unstandardized), stored in different software systems, Excel files, databases or in different departments that don't even talk to each other (the systems … maybe the departments too)
- It takes 2 people 2 days to pull this information together after it is received in order to make it usable
- This extensive manual post-processing / taking data from numerous sources and manually entering it into excel sheets leaves much room for error / manipulation
- We don't really have a good way to align systems and the ability to combine information from different (often proprietary) sources - Easily.

# How do Business Intelligence Systems come into play here

## Excel is not a BI system

## A Business intelligence system is

Standard software technology that

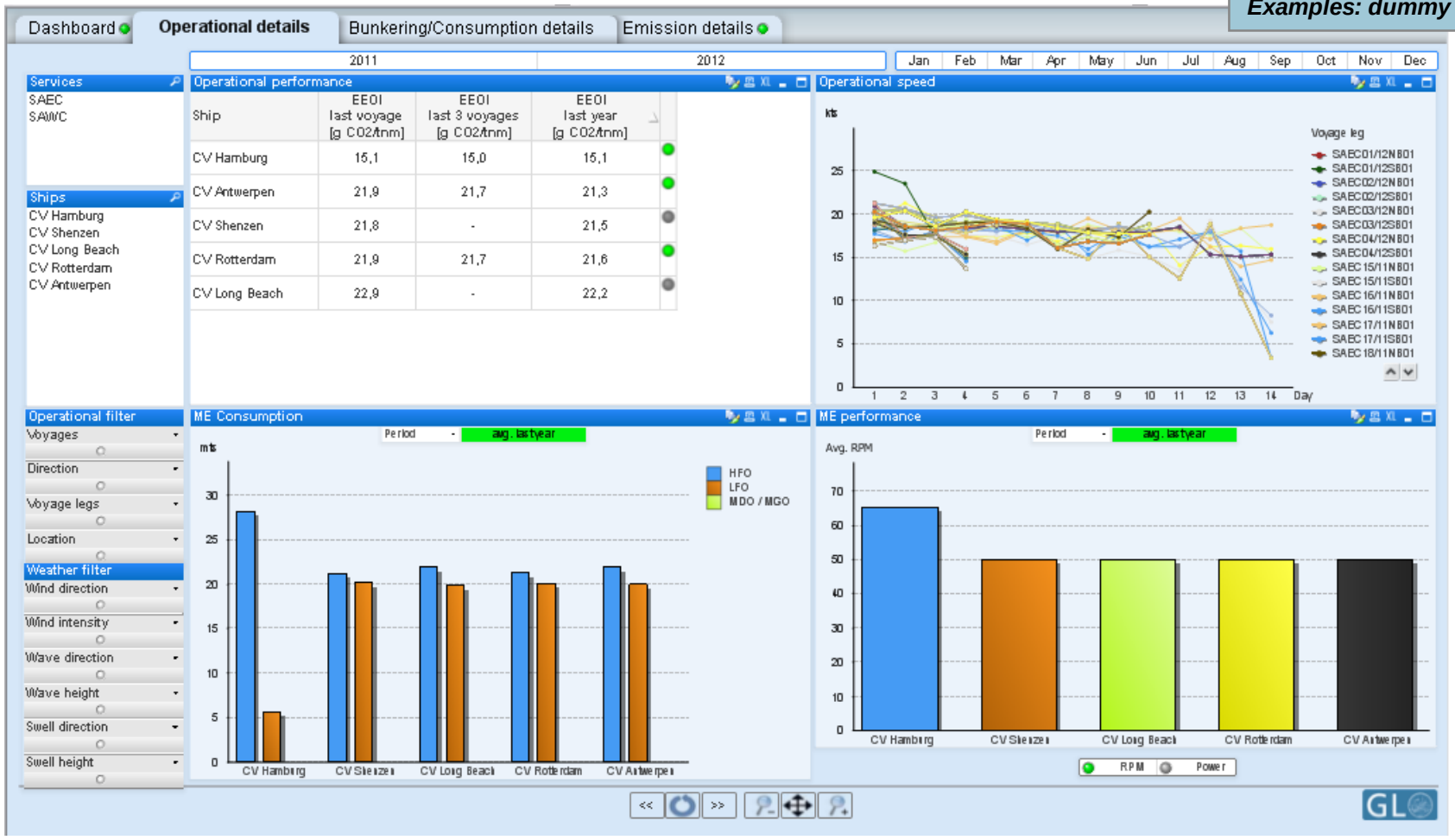
- facilitates the extraction, transformation and loading of data from different data sources
- into a user-friendly and interactive reporting and analysis package

## Is all this new

- no, but only in the last years technology has found its way from corporations to mid size companies (effort and cost wise)

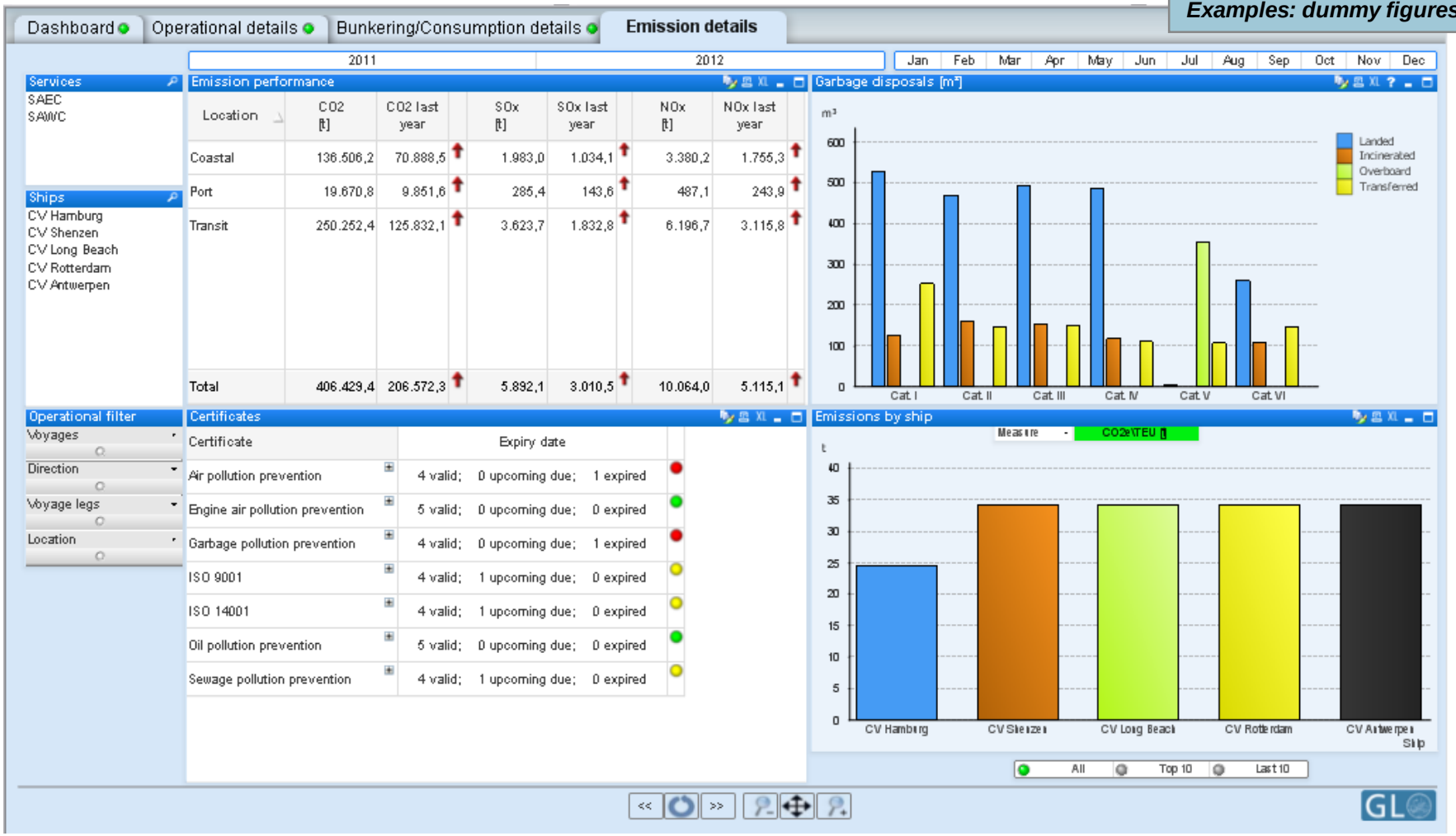
# So you get a good way to answer tricky questions and excellent standardized monitoring and evaluation

***Examples: dummy figures***



# And a systematic way to analyze emissions, consumption, engine performance and other voyage performance data

***Examples: dummy figures***



# Thank you for your attention!

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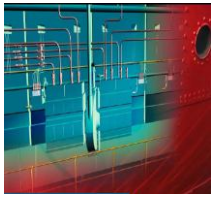
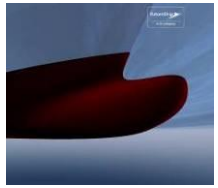
# GL offers the most comprehensive and innovative software portfolio in the industry

| Ship management | | Ship operations |
|---|---|---|
|  **GL ShipManager** Shipmanagers workbench to support all key processes (maintenance, procurement, quality / safety, onboard administration, etc) |  **GL CrewManager** Complete crew management package supporting planning, dispositioning, data / certifi-cates mgmt., rest hours, … |  **GL EmissionManager** Smart solution for onboard voyage reporting and onshore emission- and fleet performance analysis |
|  **GL HullManager** Advanced hull integrity solution supports inspections and thickness measurement processes based on interactive 3D ship model |  **GL FleetManager - Finance module** Complete finance system incl. Accounting, Controlling, Cash, Intercompany for shipping CFOs |  **GL SeaScout** Navigational decision support system helps you navigate through bad weather without damages on shortest route |
|  **GL MachineryManager** Integration platform for all condition monitoring machinery information (e.g. visual inspections, vibration, oil analysis, perf. monitoring) |  **GL FleetAnalyzer** Business Intelligence solution, gets you information out of your different operational data for flexible and powerful reporting & analysis |  **EcoAssistant** Software system to save fuel without modifying your vessel by optimal trim |

Currently in pilot stage

Provided By FutureShip