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CADMATIC

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Marine Industry

Inside this issue

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Cover picture: JUBILEE, yacht built by Oceanco in the Netherlands. Copyright © Oceanco.
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Taking advantage of digitalization

I have the pleasure of welcoming you to the first marine edition of our revamped CADMATIC customer magazine under the new title eXperience. We are continuing our efforts to bring our readers informative and useful content. I hope that you will enjoy the new look and contents of the magazine.

In 2018, CADMATIC has seen growth of around 30 percent in key markets in the marine industry. This includes both marine design applications and information management applications. Over the last 12 months, we have welcomed 57 new marine clients to the CADMATIC software users' family.

CADMATIC is strongly involved in the digitalization of the marine industry, offering unique solutions to utilize digital information in different stages of shipbuilding projects, from design and engineering to prefabrication, construction and production.

We are very excited about Meyer Shipyard's recent decision to use CADMATIC as a key element of their journey to the next level of digitalization. CADMATIC will be used at all three of their shipyards: in Papenburg and Rostock in Germany as well as in Turku, Finland. CADMATIC is an important tool in streamlining Meyer's processes in complex and extremely large cruise ship projects from design to production and seamlessly integrates multiple parties into one project.

We are continuing our strong efforts in developing the most user-friendly marine design software. Ease of use, work efficiency and integrations with customers' other systems are all key success factors. Today, we can offer a powerful and comprehensive package for hull and outfitting design, engineering, production and related information management.

In this edition of eXperience Magazine, we highlight several customer cases: Oceanco, Tsuneishi, Ghenova and Azerbaijan Caspian Shipping. The projects these customers' undertake with our software are inspiring. It also pleases me greatly that our software support services are so highly rated.

Over our 35-year journey, we have held the international CADMATIC Users' Meeting every second year in different locations all over the world. In September this year, we will be holding the event in our home town of Turku, Finland. We look forward to meeting many of our software users, to see both the latest developments and new development trends.

I wish you all happy and interesting reading.

Jukka Rantala
CEO
CADMATIC

Ghenova's unique value chain position

Solutions for Comp

Ghenova Ingenieria, from Sevilla in Spain, offers consulting and engineering services for projects in the naval, offshore, industry, aeronautics and infrastructure sectors. The multinational and multidisciplinary company has achieved a unique position as an engineering and consulting company in the value chain. It focuses on developing transversal solutions for technologically complex projects.

The company's reference portfolio includes a remarkably diverse and demanding range of projects across the sectors served. High quality engineering and consulting requires top-of-the-range support tools. In its naval and offshore projects, Ghenova uses CADMATIC extensively for hull and outfitting design. The company does not rule out implementing CADMATIC for its industrial projects in the future either.

Ghenova's history with CADMATIC started in 2014 when it acquired eBrowser licenses to be used for the upgrading of an oceanic patrol vessel. Due to growing demand from Central and Northern Europe, where CADMATIC software is widely used, Ghenova has invested extensively in CADMATIC design tools.

Federico Álvarez Ordóñez, head of tendering and estimation at Ghenova, indicates that CADMATIC is currently used by about 65 of the company's designers. One of his main tasks is configuring the best technical and economic responses to all quotation requests from customers.

"The implementation and training period was very satisfactory and the CADMATIC design tools have been well received by our staff," says Federico.

Quick adaption in intuitive and stable environment

Ghenova designers have extensive experience of working with different software packages and are thoroughly familiar with 3D design tools. This assisted them in rapidly

lex Environments

adapting to the use of CADMATIC software. Ghenova is also investing in further CADMATIC training for its employees.

"Our idea is to continue training additional staff members to increase our resources to meet market demands. Right now, we have 15 employees that are becoming familiar with CADMATIC software," Federico adds.

Federico indicates that he has seen concrete work improvements since Ghenova started using CADMATIC.

"The 3D work that is already done in the basic design stage speeds up the pre-coordination tasks and allows us to shorten the time required for detail engineering. The greater integration between the different engineering stages makes switching from one design phase to the next much easier. Compared to other design software, I think CADMATIC has a more intuitive and stable environment," Federico explains.

The World Explorer will be operated by Quark Expeditions starting from the 2018–2019 Antarctic season.

Multiple engineering projects done in CADMATIC

Ghenova is currently using CADMATIC for several interesting design projects.

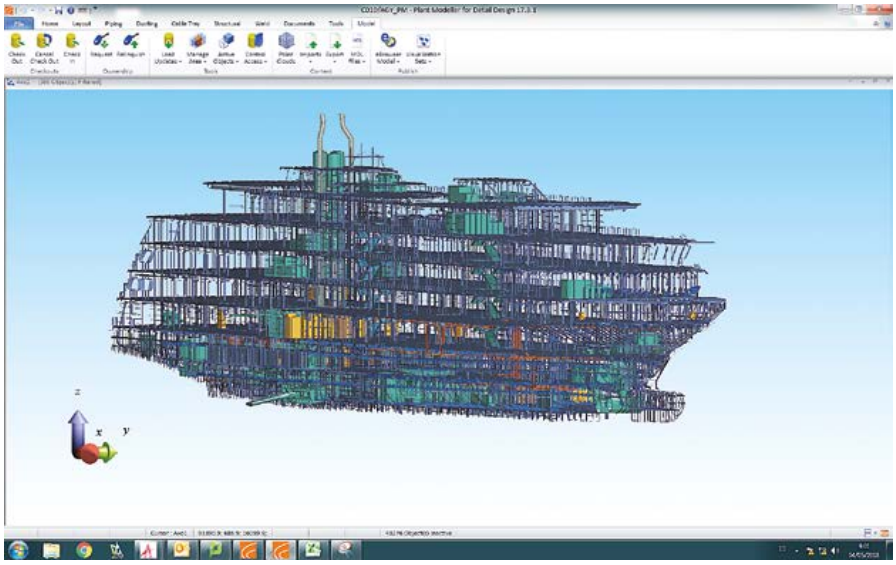
A notable highlight is the basic hull design of a luxury cruise ship for the Ritz-Carlton Yacht Collection. The vessel is a crossover between a cruise ship and a superyacht. Ghenova's commission includes the naval architecture, structural and equipment design as well as outfitting design for the vessel; all being done in CADMATIC to facilitate the rapid integration of the work.

The Ritz-Carlton Yacht Collection is a new venture designed to combine the luxury lifestyle of The Ritz-Carlton® and the casual freedom of a yachting vacation. The vessel is part of three custom-built yachts and will be launched in 2020. The yacht boasts 149 suites and can accommodate up to 298 guests.

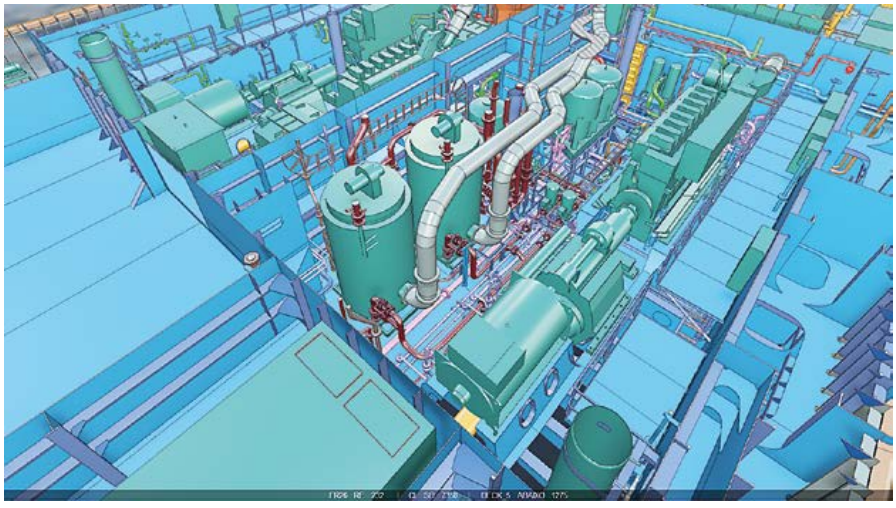
> *"Compared to other design software, I think CADMATIC has a more intuitive and stable environment."*

Ghenova is also currently using CADMATIC for the design of the World Explorer, an expedition luxury cruiser built for Mystic Cruises. A team of more than 40 designers is engaged in the detail engineering, steel and structural design as well as piping and outfitting design of the vessel. The software is also being used for the development of the coordination plans for equipment and spaces.

The newbuild, which is being constructed at Portugal's WestSea Yard, is the first of a planned series of cruise ships. It will be operated by Quark Expeditions for charter cruises starting from the 2018–2019 Antarctica season. Outside of the Antarctica season, the vessel will visit small and distinct ports around the world that are not commonly frequented by larger cruise ships.



(opposite) The Ritz-Carlton Yacht Collection vessel is a crossover between a cruise ship and a superyacht.



3D model images of the World Explorer. Forty Ghenova designers are doing the detail engineering, steel and structural design as well as piping and outfitting design of the vessel in CADMATIC.

Federico Álvarez Ordóñez, head of tendering and estimation at Ghenova, has been impressed with CADMATIC's powerful distributed design tools.

In addition to the aforementioned projects, Ghenova is also in the process of completing the detailed engineering for a reel-lay vessel and a mega-yacht.

Concurrent design the most powerful feature

According to Federico, CADMATIC is very well suited to Ghenova's current projects. In addition to the company headquarters in Sevilla, the software has also been implemented at two other offices in Spain and used for projects in three different countries.

"A key strength of the software is that it is easy to learn and use. It is also stable and has a powerful way of distributing work across different offices and sites. We have big projects with heavy workloads, so we share the work between different sites with the CADMATIC Co-Designer. The working environment is very stable and is easy to manage, which means that there is a low probability of errors resulting from concurrent users."

Broadening software use

Going forward, Ghenova plans to become more familiar with the different CADMATIC software modules in order to use them for early conceptual and basic design. There is also potential for CADMATIC use beyond the marine and offshore sectors.

"In the next two or three months we have several short-term projects where we will use CADMATIC. We might even use it for one of Ghenova's other core business area. We have improved our ratios and methods with the use of the software, which has allowed us to become even more competitive. We do not rule out the use of CADMATIC for the development of industrial projects in the future," Federico concludes.

GHENOVA

Boosting Production Information

Azerbaijan Caspian Shipping

The Design Institute at Azerbaijan Caspian Shipping Company (ACSC) in Baku has been a CADMATIC user since 2017. The Institute cites improved quality and the speed of working documentation development as some of the key advantages of using CADMATIC software.

ACSC was established in 2013, when Azerbaijan's two largest fleets – the Azerbaijan State Caspian Sea Shipping Company and the Caspian Sea Oil Fleet of the State Oil Company of the Azerbaijan Republic – were merged. Its large fleet consists of over 264 vessels. The company also operates ship repair and construction yards in the city of Baku.

The Institute has notably designed sea and railroad crossings in Eastern and Western Europe. Today, it is also engaged in the design of seagoing vessels and hydraulic structures as well as the production of workshop documentation for shipyards, shipbuilding, and the installation of ship equipment.

CADMATIC implementation

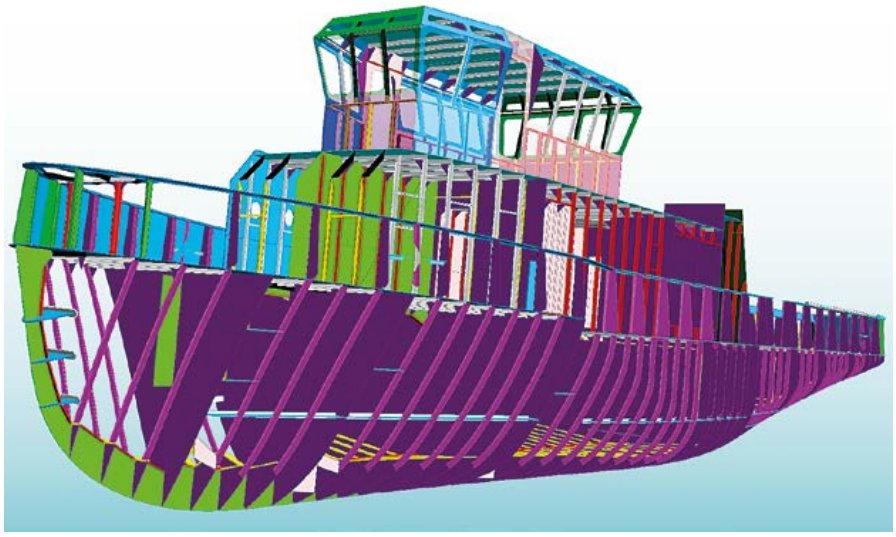
According to Oyrad Abdullayev, Director at the Design Institute, they selected CADMATIC not only because it is simple to use and accurate, but also as they found the software to be faster compared to other marine design systems.

The institute also values the fact that CADMATIC offers a full range of solutions for circuit diagrams, general layout, piping, ventilation and air conditioning systems, electrical equipment and other equipment.

"CADMATIC is one of the best available solutions in the field of marine design. It is effective and

Members of the Azerbaijan Caspian Shipping Company design team.

3D model images of a multi-purpose tug designed by the Institute. Above a model of the structure, outfitting and exhaust gas system and below a structural model.



easy to use. The software tools have enabled our company to create complete and accurate 3D ship models. That's why we chose CADMATIC software," says Abdullayev.

Multi-purpose tug designed with CADMATIC

A recent project completed with CADMATIC software by the Institute is the design of a multi-purpose tug. It will be used to tow non-self-propelled vessels and floating structures.

The vessel has a single deck, a wheelhouse with a circular view, five watertight bulkheads and an engine room located in the aft. The tug's towing complex is located in the stern of the vessel. The propulsion complex will provide five tons of traction and consists of one main engine with auxiliary mechanisms and one fixed-pitch propeller in the rotary nozzle.

Production information

The ability to generate production information with ease from the 3D model is a highly appreciated feature of the software at the Institute.

"The link to production allows us to quickly send workshop drawings to production. Before implementing CADMATIC, this required more time and attention. The synchronization between the model and drawings means that the drawings

Oyrad Abdullayev, Director at the Design Institute indicates that CADMATIC is faster than other marine design systems.

can be created in parallel with the modeling," says Abdullayev.

> *"CADMATIC facilitates the work, significantly saves time, and accelerates the verification of changes."*

Overall, Abdullayev is happy with the efficiency enhancements that CADMATIC has brought to the Institute's operations.

"CADMATIC facilitates the work, significantly saves time, and accelerates the verification of changes, if any are required."

In addition to design applications, the Institute also uses CADMATIC's eBrowser design review tool.

"We have been using eBrowser successfully in our projects. The final review allows users to go through the three-dimensional model, combine several models or make comparisons. We can also easily find and verify information about any block and control changes," Abdullayev explains.

Asked about their future plans, Abdullayev indicates that the Institute intends increasing its number of CADMATIC licenses and adding new modules, in particular the nesting module.

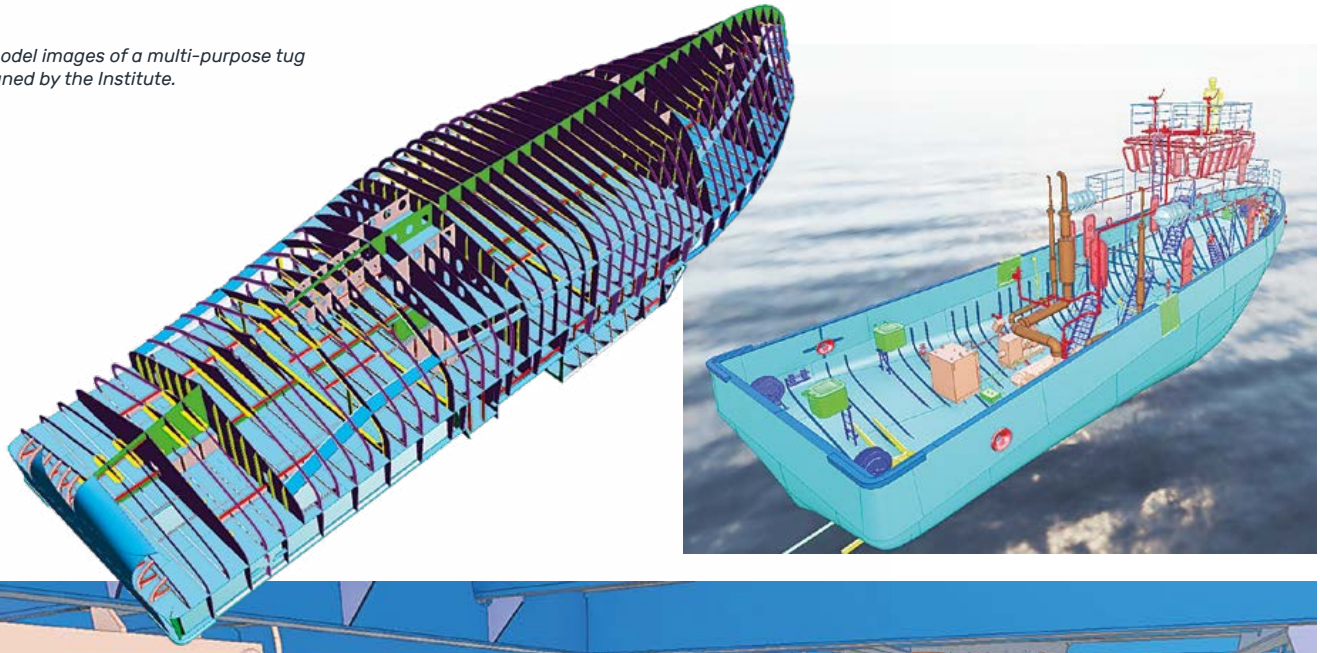
ACSC merchant fleet

- 22 tankers
- 13 ferries
- 15 universal dry-cargo ships
- 2 Ro-Ro ships

ACSC offshore fleet

- 22 crane vessels
- 25 passenger vessels
- 19 AHTSVs
- 7 PSVs
- 3 tug boats
- 8 port-tug boats
- 11 diving ships
- 6 fire-fighter ships
- 6 dredgers and survey fleet vessels
- 6 barges
- 5 geological ships
- 2 pipe layers
- 12 surface cleaner and fecal water collector ships
- 8 tankers
- 3 ship repair workshops
- 1 pile hammer ship
- 68 supporting boats

3D model images of a multi-purpose tug designed by the Institute.



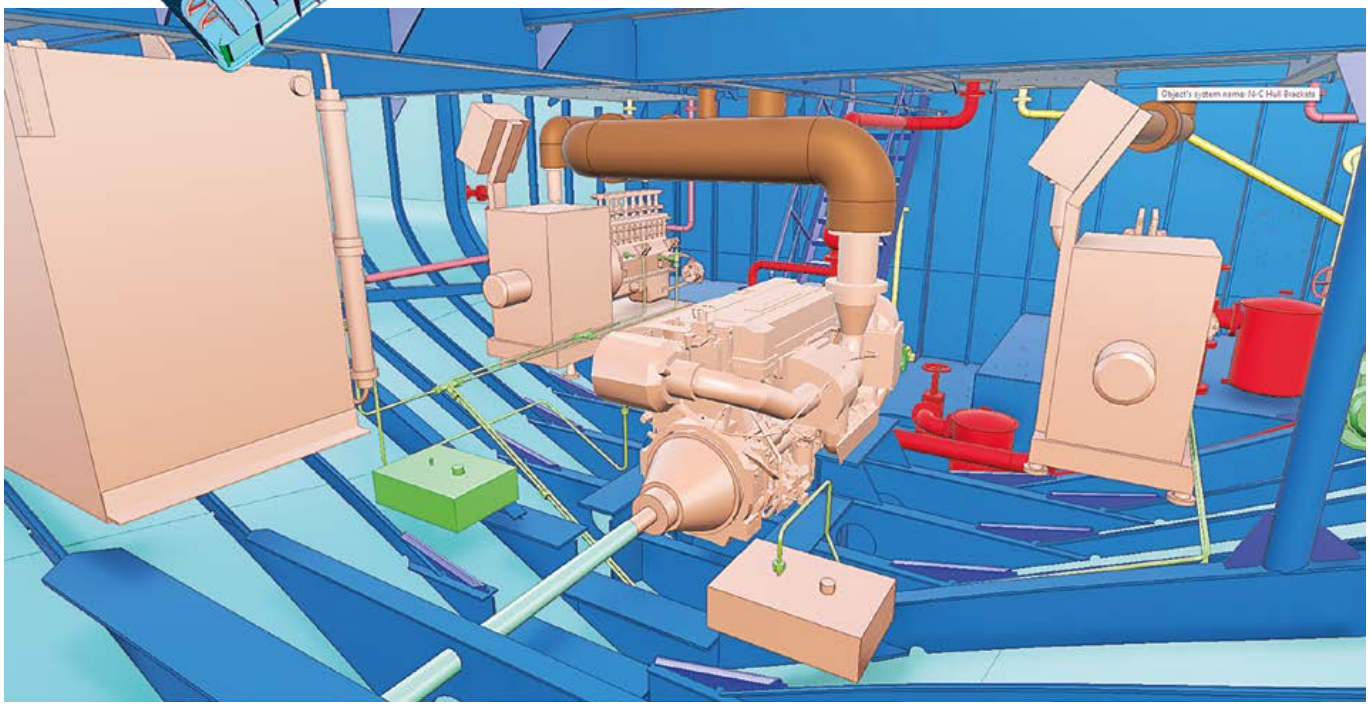


Photo © Sander Kuik / CADMATIC

Introducing Madalina Florean:

Product Owner, Hull Applications

Who is Madalina Florean?
I graduated in 2011 from the Transylvania University in Brasov, Romania, with a Master of Science degree in Informatics. During my studies, I did an exchange in Leuven, Belgium as part of the European Erasmus Program. My professional expertise is development of large-scale software systems used in engineering and the shipbuilding industry. Currently, I am the Product Owner of the CADMATIC Hull software program.

What do you like to do in your free time?
I enjoy a diversity of activities. My husband and I are internationally oriented. We love travelling and meeting local people and getting a taste of their food and customs.

In particular, I would love a direct fast connection from Groningen to Paris.

I also enjoy relaxing with a book and going to the theater and movies, or recharging my batteries at a music concert, either classical or modern. I spend quality time with family and friends and participate in different sports activities.

How and when did you end up at CADMATIC?

After graduating in 2011, I moved to Groningen and started working for what was Numeriek Centrum Groningen, now CADMATIC BV. I started as a software developer, being especially attracted to the application possibilities of the software and the international orientation of the company.

How have your tasks and/or position changed over the years?

I started as a software developer, creating software features and modernizing the software development processes and tools. After I became a Product Owner, the focus switched to planning and designing the features, as opposed to implementing them myself. I do not have much time left for actual software development, but I do guide developers especially in areas I previously worked on.

What is your current position and what are your most important tasks?

Since 2016, I have been the Product Owner of Hull applications. My main responsibility is the creation and coordination of the product backlog: an ordered list of the features to implement.

The product backlog gives structure to the implementation process, ensures that we can deliver the features according to the planning and, most importantly, must be coordinated to maximize the value of our software for the customers. I listen to all of the stakeholders (customers, management, sales, support, R&D), translate the information into clear features and present it to our Portfolio Management Team. There we make the final decision about the next steps.

Additionally, I need to make sure I communicate the information clearly to the development team so that we can achieve our goals.

What is it that you like most about your work?

Firstly, it is amazing that with a handful of people we are able to create amazing software that outperforms bigger players with far greater resources. Striking a balance is key: I need to decide what to do, when to do it, and with whom we work in order to create high-end features with high value for our customers. It is challenging and brings great fulfillment.

I am very grateful that I have bright and hard-working mentors here that I can learn from. The diverse, dynamic and international environment in the company is a great advantage. You never cease to discover new things in one way or another.

One of Cadmatic's values is delighting customers. What does that mean to you?

To me it means creating original and optimal solutions that will enable customers to go the extra mile. To lead and teach customers in creating better products, and offering flexible solutions that can be used in any production environment. It is the creation an indispensable tool.

What are your goals for 2018?

The keyword for 2018 is integration, at all levels. Every new feature must be integrated with existing features. We are integrating our family of products using a single core (COS). Furthermore, integration with other packages is pivotal in order to provide excellent solutions for other marine requirements that we are not tackling ourselves. We are participating in international research projects, such as the European Union's Holiship, where we aim to optimize ship design at every step of the design process.

Looking further into the future, I hope we can create software that enables engineers to focus on creativity, on the finesses of the job. The system itself will perform the redundant tasks. The goal is craftsmanship and creativity, which is supported by automation.

With automation and straightforward interfaces, we can make room for flexibility so that customers can apply our solutions universally, whether they have production facilities in Europe, Asia, or elsewhere.

How have you found working at CADMATIC and the R&D team?

At CADMATIC, we have a very diverse and dynamic environment with many nationalities and people with different backgrounds. This mix of cultures and ways of thinking makes it possible to come up with out-of-the box solutions and choose the right approach when needed. At CADMATIC, I can apply my knowledge and develop myself.

I chose technical studies because I like automation and mathematics. You can see that in my private life as well; at home everything is as robotic and automatic as possible. I strongly believe in technology and automation as a means of enabling people to focus on their talents and goals in life.

At CADMATIC, I found the right environment for my goals: creating cutting-edge software for state-of-the-art engineering and design. I intend playing an important role in keeping this promise to our customers.

Does one ship pollute as much as 50 million cars?

Sulphur Emissions

Text: Tomas Aminoff

An eye-catching headline that has done the rounds in LinkedIn's marine community suggested that one ship emits as much sulphur as 50 million cars. Another frequently seen statement is that the sixteen worst offending vessels create as much pollution as all the cars on the planet combined. Can this really be true? Was shipping not supposed to be the most environmentally friendly mode of transportation out there?

When I read the article, I felt a strong desire to open Excel and run a few simulations of my own on the topic. Before that, some research about the article and the boundary conditions was required. The original source was an article published in the China Daily Asia on 20 May 2016, titled *"Ship emissions choking the region"*.

The article claimed that *"Cargo ships typically use highly polluting bunker fuel, which is comprised of around 3 % sulphur – much higher than ultra-low sulphur diesel. One large container ship at sea emits the same amount of sulphur oxide gases as 50 million diesel-burning cars."*

In order to reproduce the figures I used a large modern 14,000 TEU container vessel and compared it with a 2017 Ford Focus diesel. The parameters used in the calculation are presented in Table 1. With these boundary conditions, the result is very close to the original statement in the article and any discrepancies can easy be explained.

The result of the calculations indicates that the vessel actually emits sulphur emissions equal to that produced by 59 million new diesel cars. The difference compared to the claims in the China Daily Asia article can be explained by the used engine power, efficiency and daily utilisation.

Correcting some flaws

The original assumptions contained some flaws. The next step, therefore, was to adjust the figures to better reflect the situation today.

First, the vessel speed was reduced from approx. 23,5 knots to approximately 18,5 knots. By doing this the main engine load

was decreased from around 75 % to 40 %. The amount of sulphur in the HFO was also reduced to 2,45 % to better mirror the world average for 2015.

Also, specific fuel consumption had to be increased for the main engine by 7 % and the auxiliary engine by 5 %. This was done to reflect the tolerances provided by engine manufactures. At the same time, an increase in the vehicle's fuel consumption to 7.1 l/100 km was included. This was the consumption figure displayed by a car used on the day of doing the calculations. The car was admittedly not a new Ford Focus with a diesel engine, but is still an average-sized car with a moderate-sized engine and thus reflects the existing fleet in a balanced way. All the changes are shown in Table 2.

Table 1: Reference case (ship to car ratio: 58.7 million)

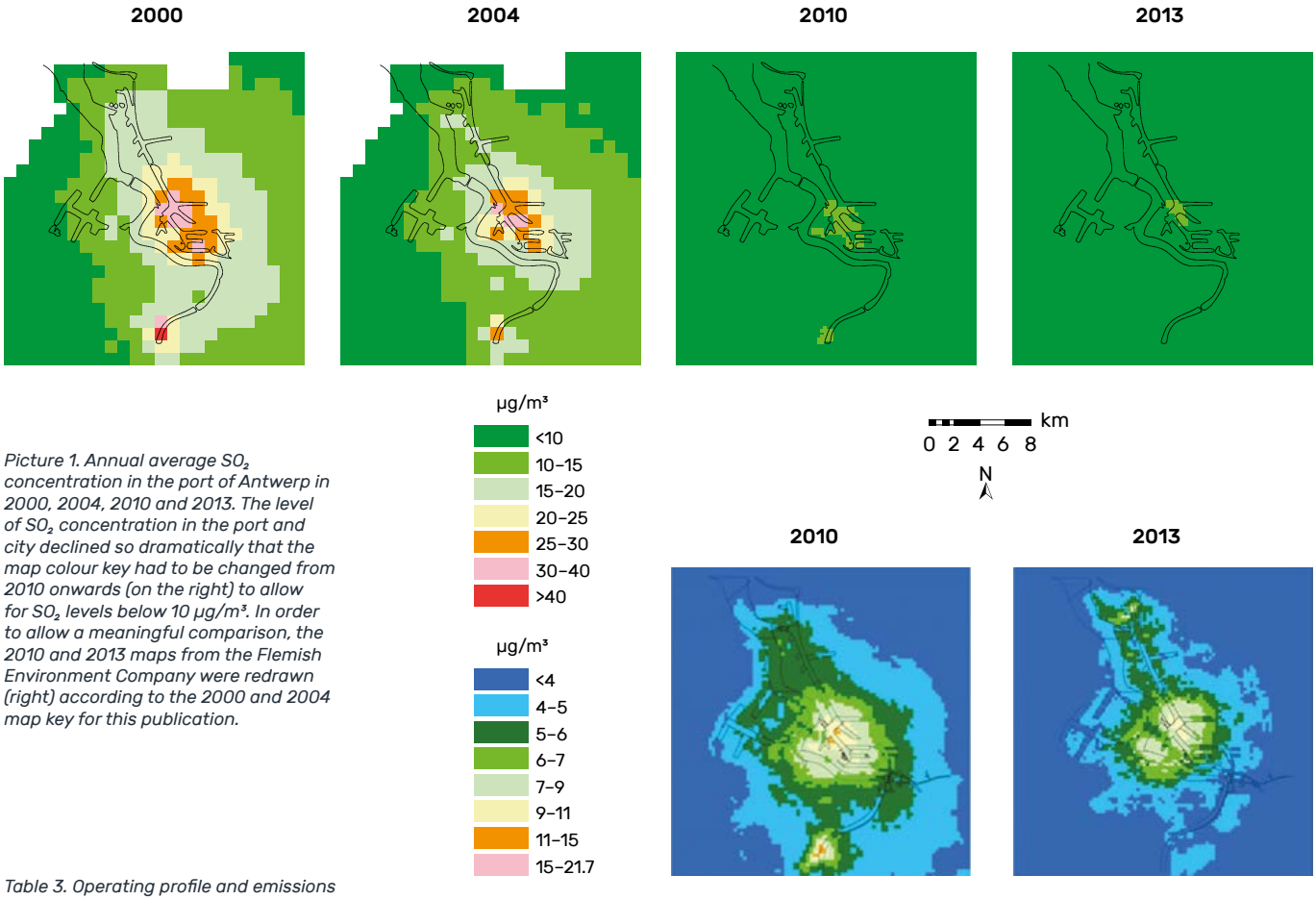
	14000 TEU Container vessel			**Car**		
Engines	1 x 2-Stroke ME + 4* 4-S AE			77kW 1.5l Diesel		
	Main Engine	*Auxiliary Engine*				
Installed power	48900	5*3360	kW		77	kW
Average load	75 %	2 engines at 75 %	kW			
Hours per day	24	24	h	**Distance per day***	55	km
SFOC (iso)	160	182	g/kWh	**Consumption**	3.8	l/100 km
LHV (iso)	42700	42700	kJ/kg	**Daily consumption**	2.09	l/day
LHV (fuel)	40600	42700	kJ/kg	**Density**	0.832	kg/l
Consumption	148.02	22.01	tonne/day	**Daily consumption**	1.739	kg/day
S in fuel	3.00 %	3.00 %		**S in fuel**	0.005 %	
Sulphur	5.10		tonne/day	**Sulphur**	0.000087	kg/day

** Source: Driving and parking patterns of European car drivers – a mobility survey.*

Table 2: Modified case (ship to car ratio: 18.8 million)

	14000 TEU Container vessel			**Car**		
Engines	1 x 2-Stroke ME + 4* 4-S AE			97kW 1.6l Petroleum		
	Main Engine	*Auxiliary Engine*				
Installed power	48900	5*3360	kW		97	kW
Average load	40 %	2 engines at 75 %	kW			
SFOC (iso)	172	191	g/kWh	**Consumption**	7.1	l/100 km
LHV (iso)	42700	42700	kJ/kg	**Daily consumption**	3.91	l/day
LHV (fuel)	40600	42700	kJ/kg	**Density**	0.720	kg/l
Consumption	84.74	23.12	tonne/day	**Daily consumption**	2.812	kg/day
S in fuel	2.45 %	2.45 %		**S in fuel**	0.005 %	
Sulphur	2.64		tonne/day	**Sulphur**	0.000141	kg/day

** Source: Driving and parking patterns of European car drivers – a mobility survey.*



Picture 1. Annual average SO_2 concentration in the port of Antwerp in 2000, 2004, 2010 and 2013. The level of SO_2 concentration in the port and city declined so dramatically that the map colour key had to be changed from 2010 onwards (on the right) to allow for SO_2 levels below 10 µg/m³. In order to allow a meaningful comparison, the 2010 and 2013 maps from the Flemish Environment Company were redrawn (right) according to the 2000 and 2004 map key for this publication.

Table 3. Operating profile and emissions during one port stay

	18 knots Service speed		**14 knots** Approaching + Maneuvering		**Harbor**	
	Main Engine	*Auxiliary Engine*	*Main Engine*	*Auxiliary Engine*	*Main Engine*	*Auxiliary Engine*
Engine load	40 %	2 * 75 %	20 %	2 * 75 %	0 %	3 * 75 %
Hours per roundtrip	2	2	2	2	0	24
Consumption (tonnes)	7.06	1.93	3.65	1.93	0.00	34.67
S tonne/stay	0.173	0.047	0.090	0.047	0.000	0.849
S tonne/stay	0.220		0.137		0.849	
Share of S	18 %		11 %		70 %	

After all the modifications were introduced the result indicated that one large container vessel in the open sea emits as much sulphur as about 19 million cars in city traffic.

Does it really matter?

This begs the question whether these figures are relevant? Does it matter whether one ship emits as much sulphur as 59 million or 19 million cars? The answer is no.

Firstly, in 2017 China will adopt new emissions regulations for on-road fuels, which are the same as those governing EU road traffic. This will cut the amount of sulphur emissions by cars from 50 to 10

ppm, which will result in a five-fold increase in the number of cars to one ship ratio, from almost 19 million to 93 million. Furthermore, in countries like Germany and Sweden the sulphur rate in diesel is typically 2–3 ppm, which would further double the number of cars to approximately 185 million.

At this point we should remember our maths lessons from school. While the numerator is greater than zero and the denominator is approaching zero, the sum approaches infinity. This indicates how different results can be achieved by selecting different, yet correct input values.

So what would be a better way to compare emissions and decide on the required actions? Rather than trying to achieve results that have more shock value than relevance, the focus should be on emissions that have the largest impact on air quality and human health. Only after this can one make meaningful conclusions.

Tracking sulphur oxide emissions

The challenge with SOx emissions is to get a clear picture of how local the emissions are. While it is known that SOx emissions can travel in the air over great distances, the majority of SOx emissions from a vessel's exhaust is emitted in the form of SO_2, which has a rather short lifespan. On the other hand, part of the SO_2 emissions is transformed into SO_4, which remains in the atmosphere for longer periods. It is also known that SOx contributes to particulate matter (PM), which is a great health concern. Local wind and weather conditions also play an important role in dispersion. Data from the Port of Antwerp's 2015 sustainability report can be used to reach a conclusion in this regard.

Measurements in the port region indicate that increased concentrations of SO_2 are rapidly diluted. After 10–20 nautical miles the concentration of SO_2 drops to less than one third of the original concentration. Thus, while fighting air quality issues over populated areas and especially in harbour cities, the focus should be on the last two hours of the voyage before the harbour call, the harbour stay itself, and the first two hours after departure.

> *As the majority of emissions originate while vessels are berthed in harbours, it is both easy to pinpoint the problem and take corrective actions.*

When the same container vessel makes a harbour call according to the profile in Table 3, the greatest contribution by far to SOx is from the port stay itself. It not only accounts for more than 70 % of the emissions, but is also where the emissions are closest to the populated area and therefore have the greatest impact on city air quality.

The fact that the majority of emissions originate while vessels are berthed in harbours, makes it not only easy to pinpoint the problem, but also easy to take corrective actions. The EU's 0.1% sulphur in fuel requirement while berthing in European harbours is a very powerful and simple tool to dramatically reduce sulphur emissions. The process is fairly simple as only vessels' auxiliary engines need to switch fuel. The result of the reduced sulphur amount in fuel at the port of Antwerp between 2000 and 2013 is clearly visible in Picture 1.

Similar patterns for nitrogen oxide emissions

Nitrogen oxide (NOx) emissions were not included in the example calculations, but one can nevertheless conclude that NOx emissions will behave similarly to SOx emissions. Most emissions that reach harbour areas are from the last few hours of trade and during harbour stays, where the majority of emissions originate from the auxiliary engines.

It would, thus, be a logic step to implement lower NOx level limits (e.g. IMO Tier 3) while a vessel is in port. It would be technically feasible to implement in the form of NOx reducers or catalysts for medium speed engines. These are proven technologies that are rather compact and affordable. When SOx and NOx are heavily reduced PM is similarly decreased.

Other options would be to shift to fuels that are totally or almost sulphur-free, such as LNG, methanol or ethane, all used today to different degrees in shipping, or to shift to shore power. All of these alternatives would reduce SOx, NOx and PM. As with other measures, focusing efforts on harbour stays alone minimises the associated costs and technology challenges.

There are several proven methods available to dramatically cut sulphur emissions in locations where the impact on air quality and human health is most significant. By directing emissions reduction activities and measures at the most critical areas, the best input/output ratio for efforts and their associated costs can be achieved.

Tomas Aminoff (M.Sc.,Naval Arch.) works as a Senior Consultant in CADMATIC's mother company, Elomatic Ltd. *This article was first published in the Top Engineer magazine 2/2017.*

JUBILEE

Largest yacht ever built in the Netherlands

Oceanco, a world-class builder of custom superyachts in the 80–140 meter range, delivered the distinguished “JUBILEE” to Burgess Yachts Ltd. in mid-July 2017. At the time of her launch, The JUBILEE was the largest yacht ever built in the Netherlands. Oceanco used CADMATIC software for the hull and outfitting design of the 110-meter vessel.

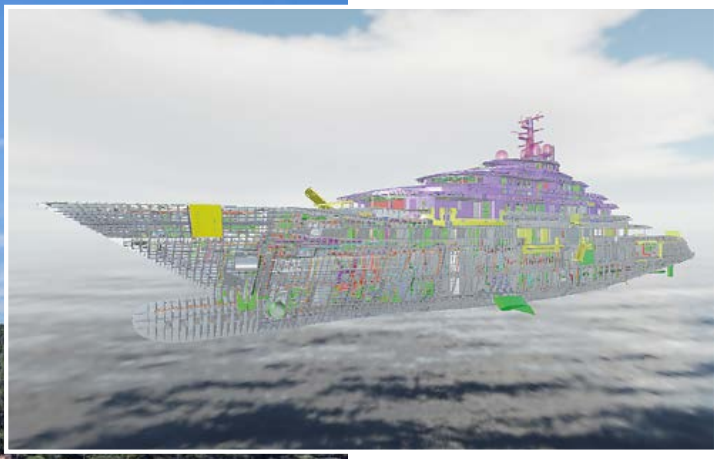
The JUBILEE project was introduced by Burgess to Oceanco in 2013. Burgess provided technical assistance and project management throughout the entire building process. The whole project took three and a half years to complete, from conception and initial sketching up to final delivery.

"This is a remarkably short period of time for a yacht of this complexity and magnitude, and so it was a real challenge to build the yacht," Marek Misiewicz, Manager IT at Oceanco, says.

Distinguished in every way

Oceanco has never built a yacht larger than the JUBILEE. With its length of 110 meters, beam of 16.4 meters and gross tonnage of 4,500, it captivates with both its breathtaking exterior and size. It can reach a maximum speed of 18.5 knots, powered by two MTU engines that each produce 4,828 horse power. The exterior styling of the JUBILEE was created by Lobanov Design, while Sorgiovanni Design sculptured the interior.

The yacht has a very noble and original profile from bow to stern, and with its longer horizontal blue lines, the JUBILEE distinguishes itself from regular yachts. The JUBILEE was awarded the 2018 International Yacht and Aviation Award for the Best Power Yacht Design in the 80 meters and longer category.



CADMATIC 3D models of the JUBILEE

JUBILEE technical specifications

- Type: Steel Hull and Aluminum Superstructure
- Delivered: 2017
- Length: 110.1 m
- Beam: 16.4 m
- Gross tonnage: 4,500 GT
- Max. speed: 18.5 knots
- Staterooms: 15
- Max. guests: 30
- Max. crew: 6
- Fully certified helicopter deck
- Engines: 2 x 4,828hp MTU
- Range: 5,000 nm

15 yachts successfully built with CADMATIC

Oceanco has used CADMATIC software since 2004. CADMATIC was chosen at the time as it was the best alternative on the market and because it was already widely used in the Netherlands.

Since the Y703/M/Y Anastasia, which was delivered in 2008, Oceanco has used CADMATIC for the engineering of some of the most beautiful yachts around the globe; 15 stunning yachts in total. Oceanco used both Hull and Outfitting software for the engineering of the JUBILEE and eBrowser for reviewing the project and commenting on the design.

According to Marek, CADMATIC is simply a good platform and environment to develop complicated and innovative yachts. *"It contains all the crucial components required and it is continuously being improved and extended."*

Cooperation is key at Oceanco
Successful cooperation with subcontractors is a key aspect of Oceanco's way of working.

"Our subcontractors work in Hull and Outfitting where they add all the necessary components to the 3D models. We monitor and supervise their work with eBrowser. This ensures that we are always in control and allows us to utilize the best experts in a given domain."

Marek highlights the distributed design features of CADMATIC as one the strongest features of the software.

> *"The cooperation between our distributed sites works perfectly thanks to the CADMATIC Co-Designer."*

OCEANCO

Oceanco is a world-class builder of custom superyachts in the 80–140 meter range. With the technical know-how and the drive for innovation, Oceanco builds perfect yachts based on the owners' vision. They work together with world-acclaimed designers and benefit from state-of-the-art engineering. Some of the latest yachts build by Oceanco are the Dar, Black Pearl, JUBILEE and Barbara.

"Since we mainly work with companies all over the world on projects, the cooperation between sites works perfectly for integrating all inputs thanks to the CADMATIC Co-Designer."

At the time of launching, JUBILEE was the largest yacht ever built in the Netherlands.

Marek Misiewicz, Manager IT at Oceanco, indicates that CADMATIC contains all crucial components required and is continuously being improved and extended.

Mature and stable software

After all these years, Oceanco is still very satisfied with CADMATIC.

"CADMATIC has proven to be a mature and stable shipbuilding environment. We believe that CADMATIC listens to its users and improves accordingly," says Marek. Looking to the future, Marek indicates that Oceanco is considering the implementation of more modules.

Oceanco is currently experimenting with eShare: CADMATIC's solution for combining, finding, visualizing and sharing project and asset information in a single and easily accessible web portal. Oceanco has also started the implementation of the Diagram module.

A complete solution for on-board maintenance

Oceanco is looking at utilizing CADMATIC eBrowser and AR/VR technologies on board yachts, as a complete solution for on-board maintenance. This would ensure a smoother experience, with continuous access to all the relevant documentation, drawings, technical specifications, and manuals for the fleet support team and the on-board crew. The project is still in the early stages of development.

oceAnco

Tsuneishi Implements CADMATIC

for Detail and Production Design

Tsuneishi Group's shipbuilding division started using CADMATIC for basic design in 2007. In 2017, it decided to implement CADMATIC also for detail and production design. The implementation project included the installation of about 300 licenses of CADMATIC Marine design and Information Management software at various Tsuneishi locations.

Tsuneishi Group's shipbuilding division mainly engages in shipbuilding and maritime transport. It has manufacturing bases in Japan (Tsuneishi Factory, the HQ) and three overseas factories in the Philippines, China, and Paraguay. It builds container carriers, tankers, 35,000-ton to 180,000-ton class bulk carriers, and other ships. CADMATIC software is

Since Tsuneishi has several design offices in Japan, The Philippines and China, it is possible for the engineers from different design offices to design with CADMATIC simultaneously. This concurrent engineering shortens the design lead time.

used at Tsuneishi at five different sites, including three shipyards in Fukuyama, Japan, Zhoushan, China and Cebu, in the Philippines.

Detail and production design implementation

The implementation of CADMATIC software for detail and production design at Tsuneishi began in early 2017 at different locations in three countries.

CADMATIC Marine Design software was customized to support Tsuneishi's ship design process and production demands. This included integrations and customizations for Tsuneishi's hull and piping production facilities and the generation of production documentation according to Japanese standards.

In recent years, many large shipyards have followed the same route of CADMATIC implementation across their design disciplines.

"Tsuneishi have been a long-term customer of ours in basic design and I am delighted that they have now implemented CADMATIC also for detail and production design purposes. This shows that they are convinced that we can improve the efficiency of their ship design and

production. We are very satisfied that so many large shipyards like Tsuneishi have implemented CADMATIC for all their ship design needs," **says Matti Juntunen, Marketing Communications Director, who is responsible for software sales in the Japanese Marine market.**

Efficiency improvements

Prior to CADMATIC implementation, Tsuneishi utilized a Japanese ship design software for detail and production design. With CADMATIC, Tsuneishi will shorten the time required to design ships and benefit from new tools and data for production.

"Tsuneishi have been able to cut the time used for a certain kind of axonometric outfitting drawing from 10 days to only 8 hours with the use of our software," says CADMATIC Technical Director for Outfitting, Matti Siltanen.

According to Tsuneishi, they have been able to reduce design mistakes by using 3D models to check hull and outfitting collisions. They have also shortened the time used for design by using 3D models to output their drawings (e.g. isometric drawings and section drawings) directly. In the factory, they have been able to set and finish their work even with only a few experienced workers by using 3D CAD.

By early 2018, Tsuneishi had already started the production of three ships for which they used CADMATIC to do the detail and production design of the vessels.

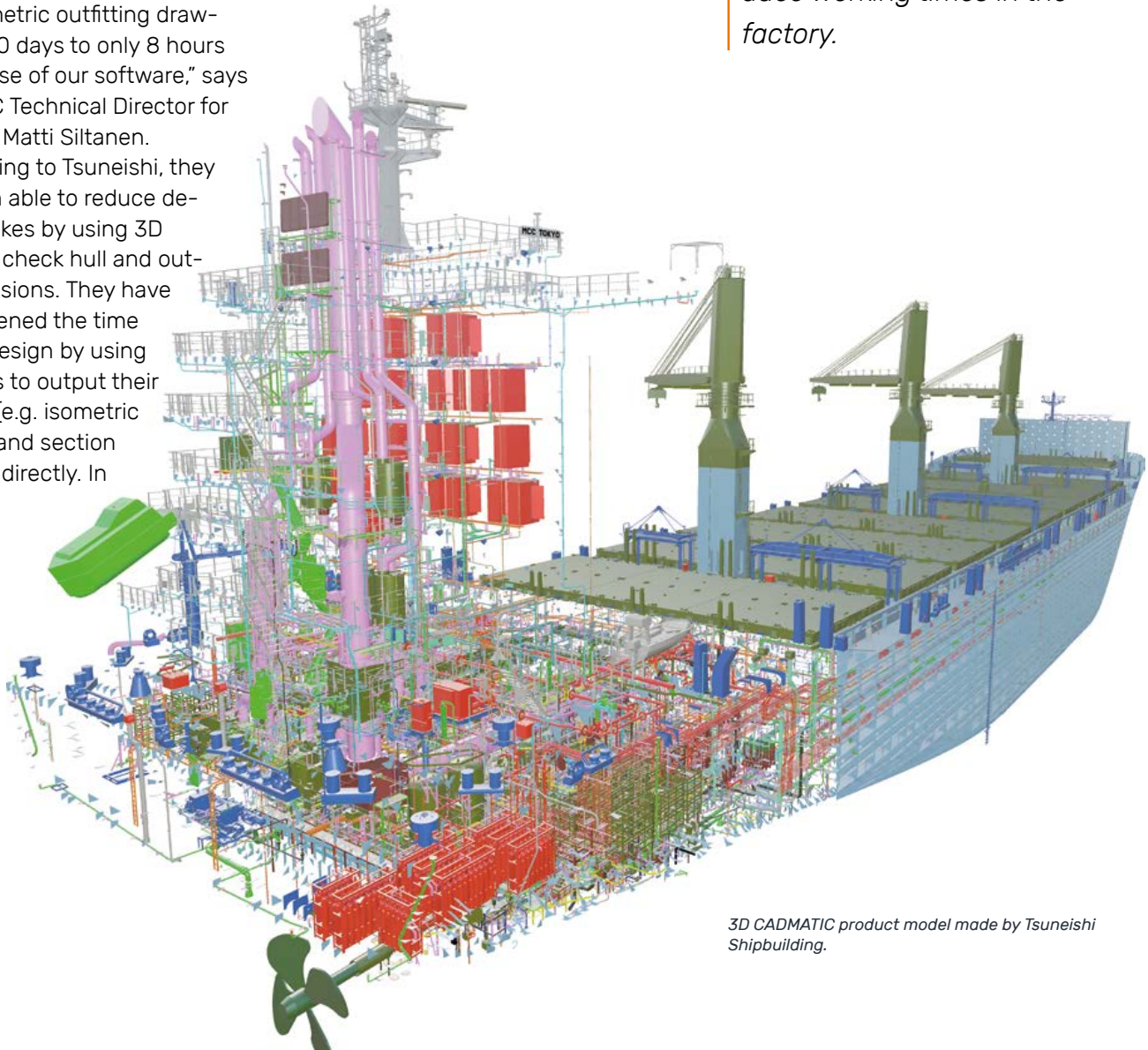
Information Management products

Tsuneishi is also an active user of CADMATIC Information Management products. Cadmatic eBrowser has been in use at the company since 2007.

The company has also recently acquired licenses for eGo, the mobile version of eBrowser, to be used in ship production.

Tsuneishi is also interested in CADMATIC eShare to see how the information management system would link with the company's different production systems. eShare allows organizations to combine, find, visualize and share project and asset information in a single and easily accessible web portal.

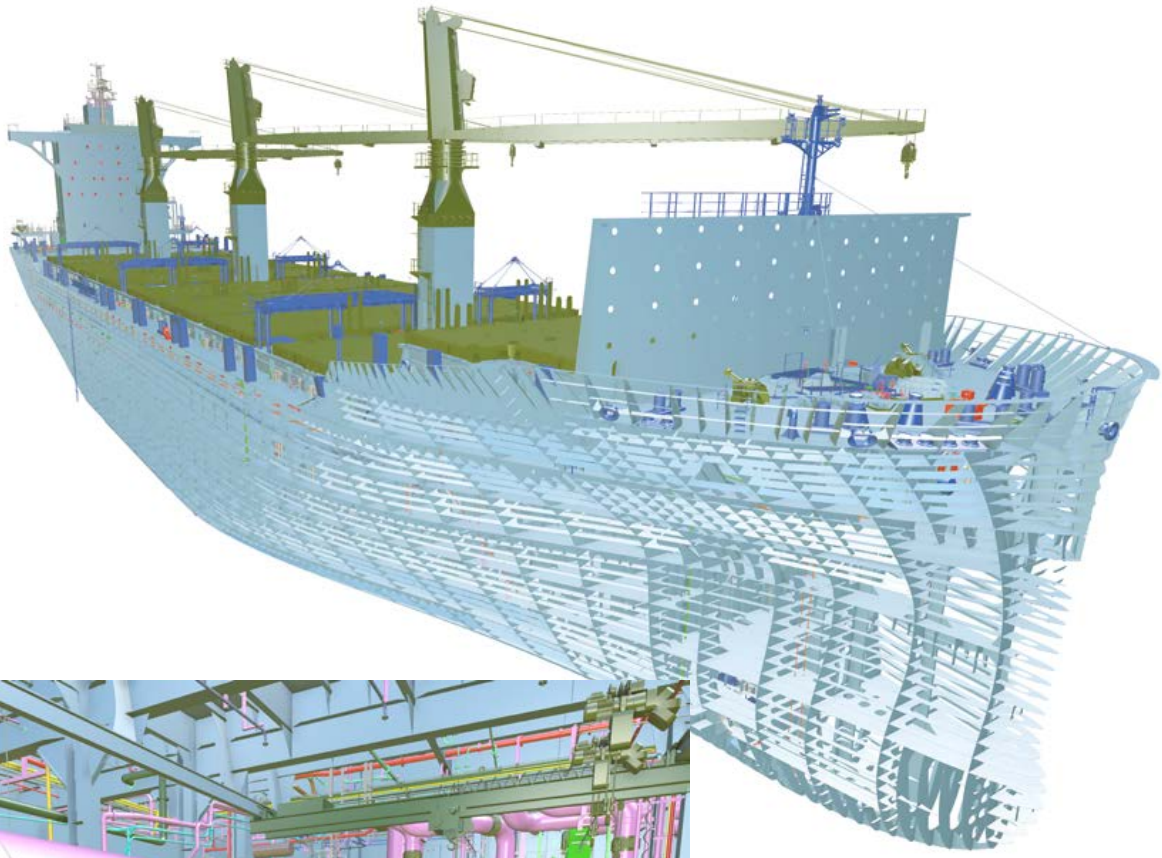
> *In the factory, Tsuneishi can confirm the purchasing and working conditions easily if the relative drawing is confirmed immediately and also reduce working times in the factory.*

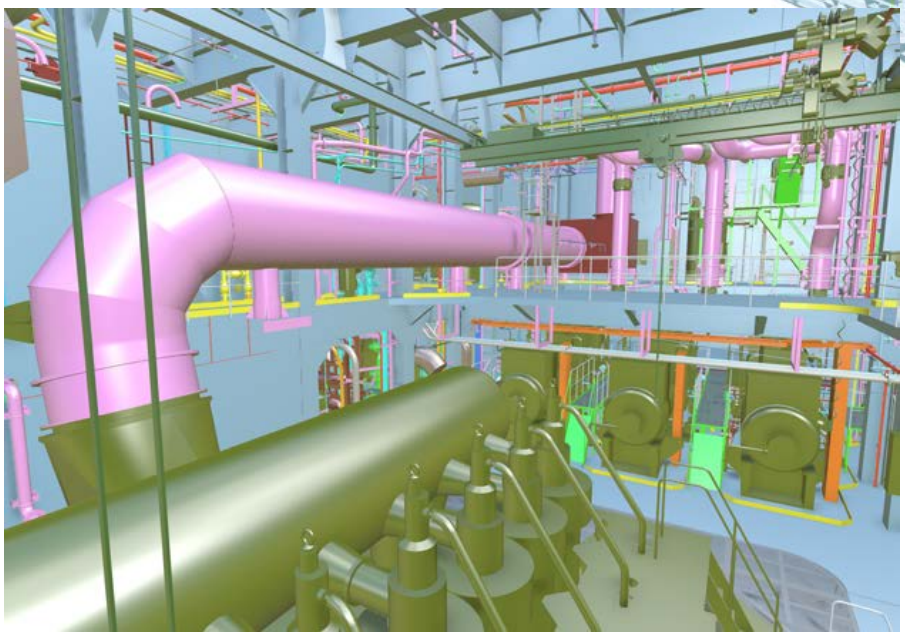


3D CADMATIC product model made by Tsuneishi Shipbuilding.

Tsuneishi Shipbuilding Co., Ltd.

Field of Business:	Shipbuilding, repairs
Commenced Business:	July 1917
Capital	JPY 100 million
Turnover:	154,300 million yen (Total of consolidated subsidiary of Shipbuilding business in 2016 fiscal year)
Employees	897 (as of December 2016)
Affiliated Companies	57 companies / 1,258 employees (as of December 2016)
Head Office:	Tsuneishi Factory, Fukuyama city, Hiroshima, Japan





Container ship designed with CADMATIC.

Photo © depositphotos.com/Jirsak. X-BOW model courtesy of Ulstein Group ASA

Intellectual Property Rights

Ensuring protection in distributed CAD environments

Due to the growth of project complexity and the rising demand for digital 3D models and production data, the most valuable intellectual property of organizations is increasingly stored in digital project environments. This raises a critical question: How can we best protect intellectual property rights (IPR) in distributed CAD environments?

Simultaneous access to 3D models and the ability to share designs through viewer files are some of the most important features of modern CAD systems. These features are business-driven: organizations often need to outsource parts of design work to niche specialists or make use of the most competitive resources around the world. The implementation of distributed design systems allows these goals to be achieved.

Access to highly valuable assets in distributed environments

Through sharing 3D models and related data, companies provide access to their most valuable assets. At the same time, they also gain access to external knowledge and expertise. Besides well-known concurrent design tools, most modern CAD software enable work in a distributed environments where participants from different companies and locations have access to the same CAD project data. This process is normally backed up by various legal agreements and contracts, often including a Non-Disclosure Agreement. Are these measures sufficient though, and what role can CAD play in this regard?

It must first be acknowledged that CAD software providers are no longer only suppliers of design tools. They have become deeply embedded in the value created during the life cycle of a design project and beyond: CAD software has evolved into being a hub of knowledge. It stores libraries of parts and fittings according to various standards, in-built design rules and specifications, predefined modules and parts of vessels.

The role of CAD in Marine design projects and asset management is evolving slowly, yet steadily. There is a shift from knowledge facilitation or simple modelling to knowledge sharing, and in this context, also knowledge protection.

IPR in CAD distributed projects

Developers of Marine CAD environments have to balance the conflicting needs of facilitating knowledge creation and information sharing and the need to provide IPR protection. Little help is being provided by regulatory frameworks. The EU regulations for IPR in the shipbuilding industry, for example, do not set particular conditions for data sharing within distributed CAD environments. This leaves CAD providers to decide how to ensure customers' IPRs are protected without damaging the fragile value co-creation process in design and subsequent asset life cycles phases.

> *Through sharing 3D models and related data, companies provide access to their most valuable assets.*

The first port of call is identifying possible sources of information leaks. The amount of interfaces between software tools has grown strongly in recent years and naturally deserves scrutiny. Traditionally, software vendors have avoided building interfaces to other vendor's products, precisely as they have tried to avoid disclosing their database structures and providing access to their core data. However, the development of neutral data formats such as IFC, JT or STEP has mitigated these concerns. The interfaces are often separately licensed and can be easily controlled with simple administration settings.

A similar process was seen with mechanical CAD, albeit a significantly simpler one. Mechanical CAD models are "lighter" and do not contain as much topological data as is commonly found in ship design. It is, as such, much easier to integrate Mechanical CAD with PDM/PLM software.

Restricting access to project data

The most common mechanism used to safeguard sensitive information is to restrict access to certain areas or parts of databases. So-called filtered replication provides access control to connected sites.

The main design company in a project, for example, can control what parts of the project are visible to other participants. This process is often complex and requires additional definitions and system setup. However, it could be approached from the designer's perspective: using 3D spaces to define an area. This approach is familiar from the way a design team's work is separated. It ensures the integrity of the design by placing the responsibility for each area inside the team and controlling only overlapping areas where all teams are involved. See figure 1.

Controlling content of viewer files

Business managers and other participants less involved in the core design process commonly make use of 3D viewers to access design features. These files contain a limited amount of data and do not pose a large IPR risk. Design solutions used in particular areas may nevertheless be considered valuable assets to the design company, and should be protected.

A filtered replication process, as described earlier, can be used to restrict the content of viewer files on a particular site only to selected

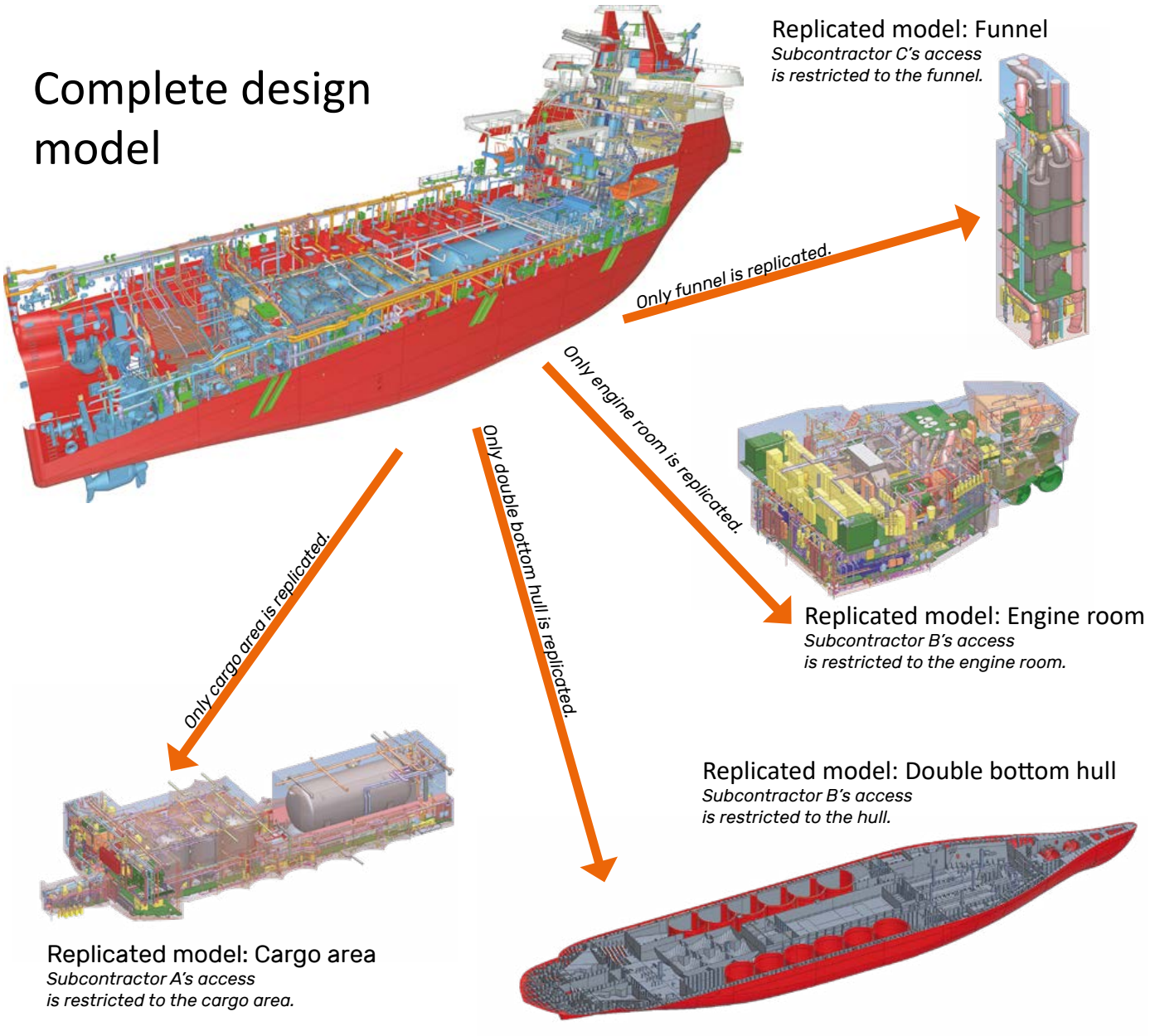


Figure 1. Illustration of distributed design based on design areas: different parties access only designated areas of the whole project. Project model courtesy of Wärtsilä Ship Design Norway AS.

areas. The validity of viewer files can also be restricted to provide an additional security layer. The owners of designs often require access via 3D virtual walk-around during the design and building phases, but wish to restrict access to the entire model after the project is completed to avoid copying of their design solutions.

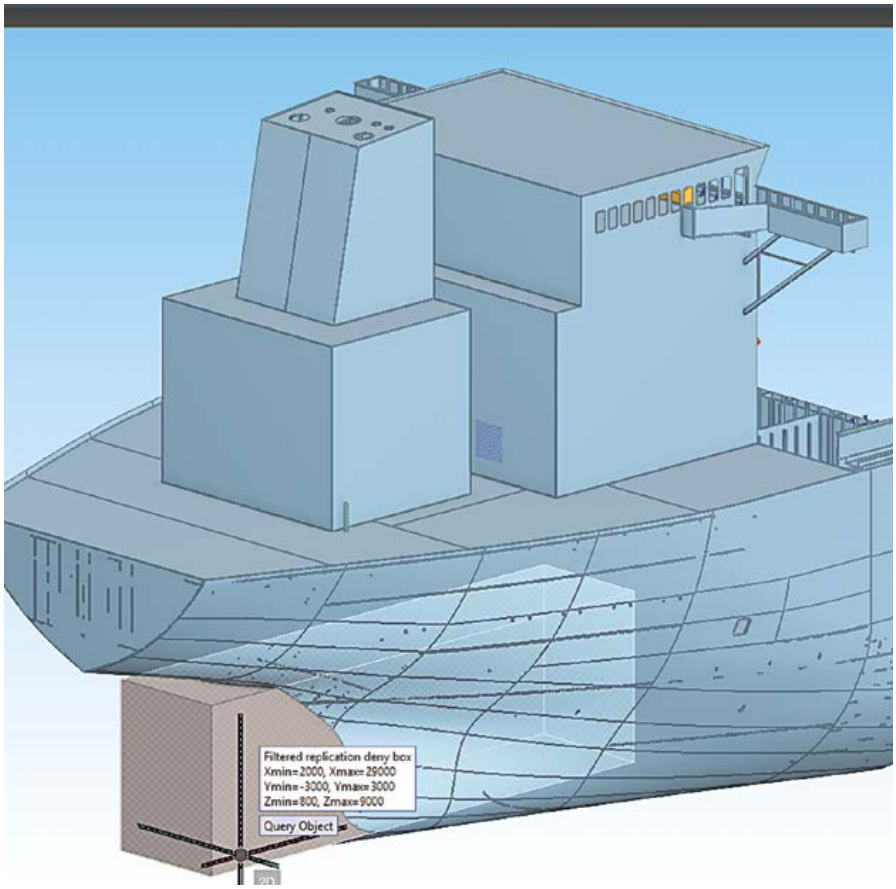
CADMATIC approach to IPR

CADMATIC's distribution design solution is based on a smart database-centric client server system that efficiently stores 3D ship models, documents and component libraries in master and replica databases hosted by a database server system.

Ensuring the integrity and security of project data at all times receives the utmost priority. In globally distributed projects, data is updated at set intervals between remote design sites via an online network such as a secured internet connection, or by simply exchanging the file in an email attachment.

CADMATIC provides filtered replication to protect intellectual property rights. If a company prefers a subcontractor to only have access

Figure 2. A visual deny box in 3D view for filtered replication in a distributed project.



CADMATIC's easy-to-set-up replication mechanism without extra modules or fees has effective tools to protect the IPR of 3D designs.

to their own parts of the project, it can be implemented without additional licensing or tools. The project replication setup can include a filter for 3D objects via a 3D box based selection. This way, the remote design team only has access to the part of the 3D model needed for their tasks.

With filtered replication, subcontractors have access only to designated areas of the project, and cannot publish viewer models of the whole project. When drawings are created, it is possible to use drawing mask boxes to restrict visibility in drawing views. Objects that are completely inside a mask box are not shown in drawing views. Objects that are partially inside a mask box are clipped in the visualization and the part of the object inside the box is not visible. Expiration dates for viewer files provide the possibility to control access to the design solutions after completion, which ensures that outdated files are not used.

The CADMATIC approach provides all users with an easy-to-set-up replication mechanism without extra modules or fees, as well as effective tools to protect the IPR of 3D designs.

Conclusion

The increased sharing of data during and after design projects, as well as the growing amount of integrations between software products have enhanced the need for IPR protection. Providing efficient mechanisms to protect IPR within distributed environments and ensuring data filtering according to access rights are non-negotiable.

At CADMATIC, we have developed tools that allow design owners to efficiently control access to their designs and thus protect their most important assets. The use of filtered replication technologies is a core component of the CADMATIC solution.

This article is a shortened version of the paper: 'Protecting Intellectual Property Rights in Distributed CAD Environments' by Ludmila Seppälä (MSc, MBA) presented at the 18th International Conference on Computer Applications in Shipbuilding (ICCAS), Singapore, 2017.

New Software Features

Diagram, Outfitting, Hull & IM

CADMATIC's 2018T2 software release is packed with exciting new features in Diagram, Outfitting, Hull and Information Management. This article highlights some of the new features.

Diagram

Drag lines and move symbols or labels with grips

Version 2018T2 supports an intuitive way to modify diagrams. It is easy to drag lines and move symbols or labels and keep lines connected using visual grips. A small dot in the midpoint of the line or symbol indicates the grip point. By simply dragging, the item can be relocated.

Data from eShare to Diagram

When a project is connected to the eShare server, the user can view eShare data directly from the Diagram.

Consistency check

By default, a Consistency Check is performed before a diagram is released to 3D modelling in order to guarantee the validity of the data in 3D design. The Consistency Check can be run directly from the diagram ribbon for the active diagram. The following issues are reported and many of them can be solved directly with the use of the Consistency Check tool:

- Conflicting flow directions
- Pipes, valves and instruments without nominal sizes
- Diagram items without proper identifiers (e.g. Pipeline or Position ID)
- Unconnected ends of pipelines, instrument lines and cables

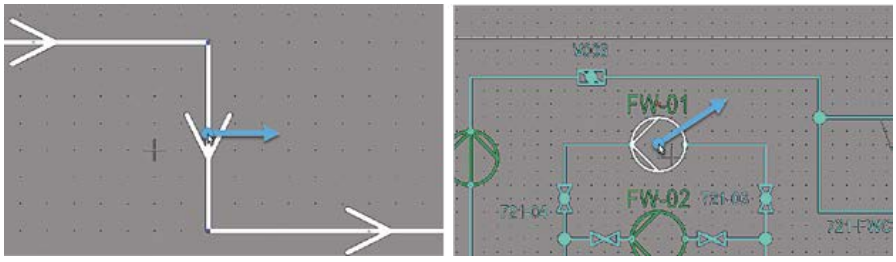
Outfitting

Cut and join pipes/ducts/cable trays

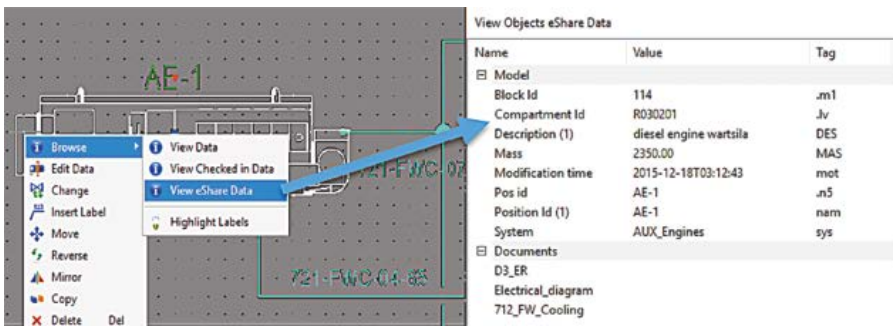
New visual tools show cut planes in all similar cases: cutting pipes, ducts or cable trays. When the cut tool is enabled, moving the cursor over a pipe finds the nearest centerline point, and the designated point and the cut plane are visualized for the user. There are also text labels that indicate the distances from the centerline endpoints, and the distance values can be manually edited to move the cut point to a specific location. Also for joining operations, the cut point is clearly visualized.

Deny boxes in replication

Filtered replication was released already in Filtered replication was released already in 2017. In version 2018T2, we have added an extra layer for protection of IPR in the form of deny boxes. When a replica site is created, access to some



Visual grips can be used to easily drag lines and move symbols or labels.



eShare can be viewed directly from Diagram.

New visual tools to cut and join pipes, ducts and cable trays.

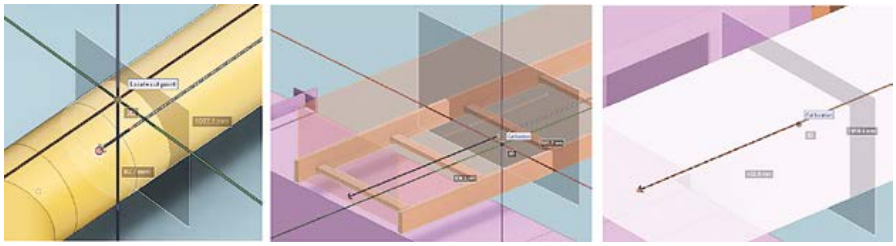
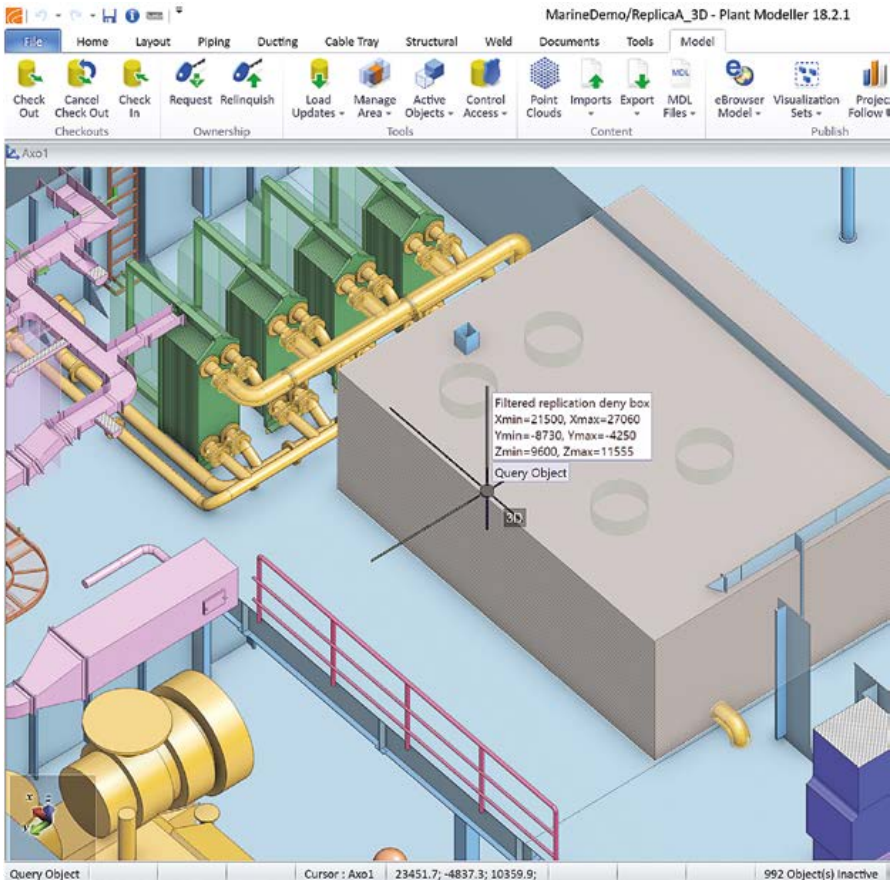


Illustration of the distributed design 3D model with restricted access area.



areas in the 3D model can be restricted. The deny box at the replica site visually hides objects in the 3D model, leaves empty spaces in eBrowser files and hidden boxes in 2D drawings. This allows access to an area while specific know-how can be restricted.

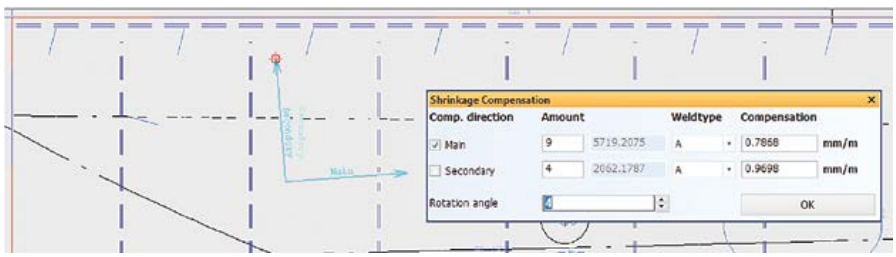
Hull

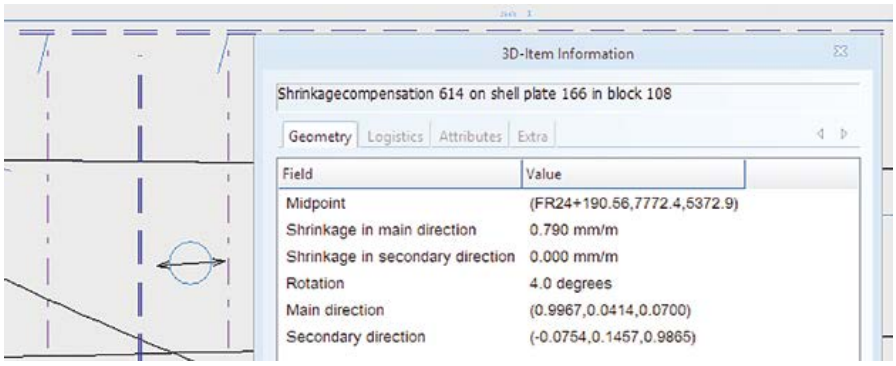
Shell application developments

Shrinkage compensation is now possible in 2D and 3D directions. A shell plate can have a shrinkage compensation attribute. In this case, the default 3D shrinkage compensation is overruled by the 2D shrinkage compensation attribute when it is coded.

The Shrinkage Compensation user interface is similar to the Shrinkage Compensation for

Shrinkage compensation in 2D and 3D directions.





regular plates. For shell plates, the 2D shrinkage compensation direction can be defined by the user in order to align the compensation.

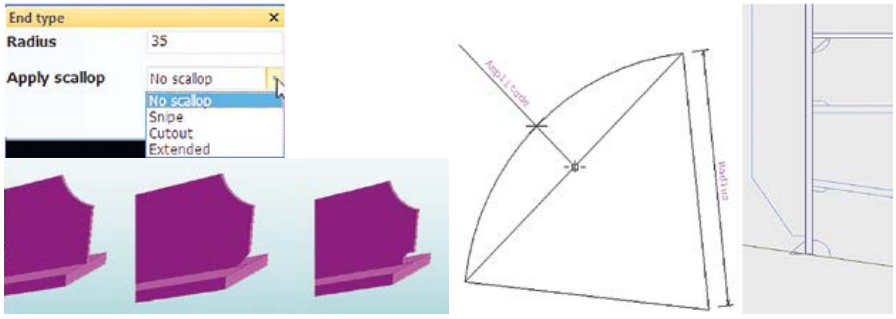
Amplitude Type file line
The new Amplitude statement gives the user more flexibility when defining ends, cutouts and holes. The pictures are examples of this new method, which makes the definition so flexible that only one type is applicable to all four shapes.

Hull Clone
The new "Hull Clone" feature provides users with the possibility to execute heavy operations, such as updating, recalculating or exporting all blocks using Javascript. The user can control all settings and run the script on any machine, connected to the project with access to project data. The "Hull Clone" feature helps to reduce the time needed to recalculate all parts, e.g. for Hull shape updates, changes in parameters or reference planes in HilTop, sending blocks to Outfitting.

Support for Unicode symbols
Hull supports Unicode symbol characters in drawings, sketches, and DXF/DWG. Text on cutting data is currently under development and not available in version 2018T2. The user can insert and modify Unicode symbol characters in drawing functions and system management settings. It allows the creation of all output data in any language with Windows fonts.

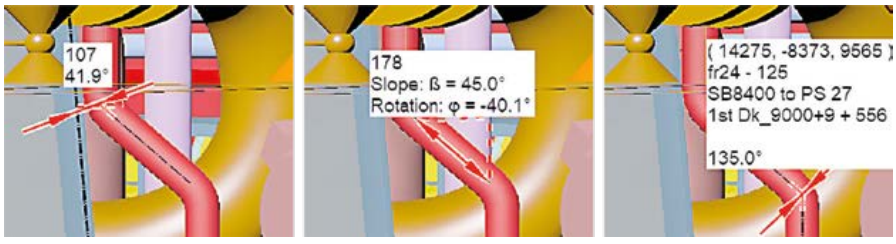
Information Management

eBrowser
The Measure tool also provides angle dimensions between lines when two lines are selected for slope and rotation values, if the same line is selected twice, or for



The new amplitude statement gives the user more flexibility.

Unicode symbol characters are supported in Hull for drawings, sketches and DXF/DWG.



The measure tool provides angle dimensions between lines.

an angle between a line and a coordinate plane. More information can now be published from the 3D model to eBrowser: information about node points of equipment and standard components and values of enumerated attributes.

eShare

In the 2018T2 release, we provide our customers with the opportunity to try the new 3D visualization in a 64-bit eShare app. This public preview version contains the new visualization core, a big step forward in how eShare models look, and takes the rendering performance to a completely new level.

eGo

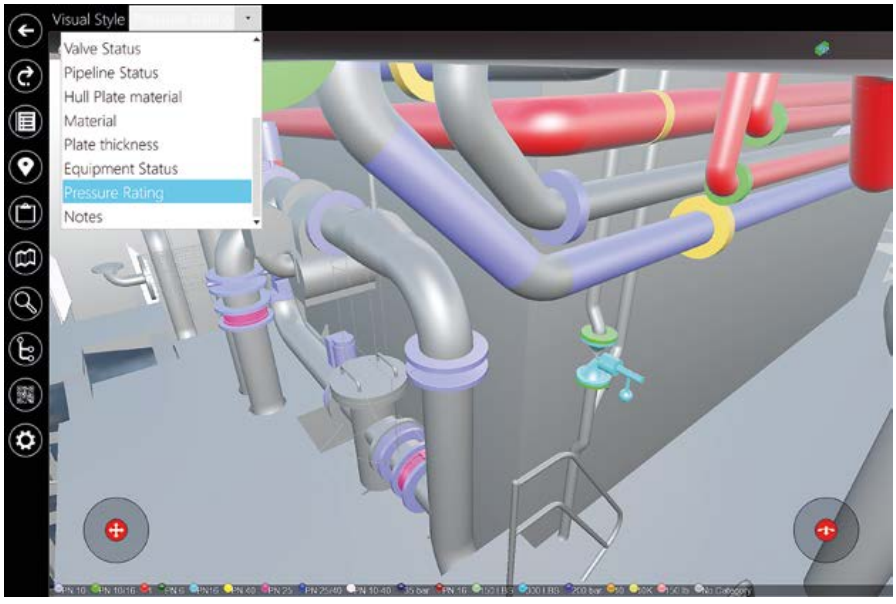
eGo continues to gain more functionality related to its close connection with eShare. Dynamic hierarchies are loaded to eGo together with the 3D model so that colors can be changed on the fly according to the attribute values. In addition, the user can multi-select objects to assign status information. Other new developments are the availability of links between 2D documents and the 3D model in offline mode and optimized synchronization of documents for offline use that includes only updated documents.

Scan the QR code for more details of the 2018T2 release.

https://www.CADMATIC.com/en/products/release-highlights/2018t2/

The Beta version of the new 3D visualization in a 64-bit eShare app is available for testing.

Colors can be changed on the fly in eGo according to the attribute values.



CADMATIC is a leading 3D design and information management software developer and supplier for the marine, process and energy industries.

- CADMATIC's main offices are located in Turku, Finland and Groningen, the Netherlands.
- We have staff in Australia, China, Hungary, India, Italy, Russia, Singapore, Spain and the UAE.
- We have certified resellers and support partners in 15 countries in Europe, Asia and America. Our growing customer base includes over 1000 customer organizations in 57 countries.

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