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Evolution is the name of the game

THE 10TH ANNIVERSARY OF THE IPHONE just went by. From being initially regarded as a flash in the pan, the iPhone today is considered cutting-edge in cellular phone technology and especially in terms of customer insight.

Its introduction heralded a sea change in the mobile phone industry, leading to increased adoption of smartphones, making them an indispensable part of our day-to-day lives. This provides a compelling case for us to chase progress and change and dare the boundaries of possibility.

Why is this important? Well, simply put, because we, at Wärtsilä, understand the extraordinary opportunities that come up when we pay close attention to changing needs. Keeping pace with progress helps us actively innovate new solutions and products, and predict trends in the marine and energy ecosystems. Our ambition is to enable sustainable societies with smart technology. To have the required insight and foresight, we choose to interact closely with our customers and likeminded industry players.

This issue will tell you how well we are in sync with developments in our industry, across geographies, and what it means for our business. For instance, our reportage decodes Australia's energy crisis and spells out how our solutions can help the country strike a balance while switching over to renewable energy sources. Another story looks at ways to use hybrid energy for making island nations truly self-sufficient in their power generation. Our review of the maritime industry shows how coordinating efforts across the value chain today has high impact on vessel efficiency and emissions across the globe. Wärtsilä's partnership with Carnival Corporation is a fine and concrete testimony of the value of a close partnership.

Readers of Twentyfour7. are in for a visual treat as we bring you stunning images from the technologically advanced and uniquely designed ferry – MS Megastar. We also give you a sneak peek into the workings of Wärtsilä's state-of-the-art Fuel Laboratory Services, where novel fuel flexibility options, like reclaiming the fuel content of plastic waste are being explored. It is a matter of pride that our solutions are setting new benchmarks.

These stories will help you understand the myriad possibilities that exist in the world around us, and how there is so much more we can do. I have no doubt the intersection of the internet, advances in computational power and the creation of new, more sophisticated machines will see the technological evolution continue. And we must evolve and progress accordingly to stay ahead of the curve. Our journey has only begun.

Atte Palomäki

Executive Vice President Communications & Branding atte.palomaki@wartsila.com twitter: attep

She gets to enjoy her first fresh jelly melon.



WÄRTSILÄ CONNECTS THE DOTS **(**

You can be sure to find what you need from the only complete marine offering. Our shaft generators are a particularly efficient and environmentally sound way to generate electricity. They lower fuel costs, and reduce both maintenance and lubricant costs. For more profit and nature friendly benefits, go to www.wartsila.com







[IN BRIEF]

News

EYES ON ENERGY STORAGE

In July, Wärtsilä completed the acquisition of Greensmith Energy Management Systems Inc. (Greensmith), a US-based leader in intelligent energy storage technology and solutions. The acquisition enables Wärtsilä to expand its footprint in the energy storage market and position itself as a leading global energy systems integrator.

Wärtsilä aims to become a global systems integrator with full in-house capabilities specialising in solutions that offer the combination and optimisation of different forms of power generation, energy storage and demand side management. The acquisition gives Wärtsilä an industry leading platform to offer across an installed base of over 63 gigawatts of power generation around the world.

"Together with Greensmith we will become a global energy systems integrator. Greensmith provides unparalleled software and energy storage knowledge and we provide our global footprint, EPC expertise and large sales network. A perfect match," says Javier Cavada, President at Wärtsilä Energy Solutions.

"We are very excited to become a key part of Wärtsilä, a global leader in advanced energy solutions," says John Jung, CEO of Greensmith. "The combination of Greensmith's proven technologies and Wärtsilä's global footprint in advanced energy and power plants will fuel significant growth in both the integration and solutions markets."

> For **more** articles and online-only **features**, visit wartsila.com/ twentyfour7

EXCITEMENT



ENERGY AAKE THINGS HAPPEN

Wärtsilä **GLOCAL** WATCH

ANTARCTICA:

L'Astrolabe is a 72-metre polar logistic vessel that will be used to transport personnel and supplies to the Dumont d'Urville research station in Antarctica. The ship, launched in July, is fitted with a complete Wärtsilä propulsion machinery package and Wärtsilä NOR (NO_x Reducer) SCR (Selective Catalytic Reduction) exhaust gas cleaning systems for all the main engines. This is the first vessel operating with the **International Maritime Organisation's IMO Tier III EIAPP (Engine International** Air Pollution Prevention) certified Wärtsilä diesel engines.

NORTHERN EUROPE:

By including turbocharger services in its global service portfolio, Wärtsilä is engaging customers worldwide and giving new meaning to global care. In January 2017, four new dedicated turbocharger maintenance workshops were added to its portfolio of around 70 service points around the world, of which over 20 currently have special turbocharger capabilities. The new workshops in northern Europe -Murmansk, Russia; Rubbestadneset, Norway; Gdansk, Poland; and Schiedam, Holland - will handle turbocharger repairs and overhauls coming from the global Wärtsilä engine fleet and, in addition, will support other engine brand turbochargers as well. Each of Wärtsilä's over 20 Turbocharger Services workshops is certified by the turbocharger manufacturer and will employ several certified engineers.



Wärtsilä will supply a 15 MW solar PV power plant to Essakane Solar SAS in Burkina Faso. The solar PV plant will be built next to a 55 MW Wärtsilä power plant currently running on heavy fuel oil. The solar PV plant and the engine power plant will be controlled and operated in synchronization, thus forming the largest engine-solar PV hybrid power plant in Africa. Wärtsilä's scope covers the engineering, procurement & construction (EPC) for the solar PV power plant, including the control system for the hybrid plant, as well as a service agreement for the PV power plant, which is scheduled to be operational in late 2017. With this project, Wärtsilä will have over 6800 MW of installed capacity on the African continent.

[WORDS & NUMBERS] USEFUL DEFINITIONS AND NUMBERS OF INTEREST.

ΙoΕ

The Internet of Everything combines products, people, processes and things. It includes interactions between machines (M2M) and machines and people (M2P), as well as between people (P2P).

DER

Distributed energy resources, for example, solar photovoltaic (PV) or wind power.

362 metres

The length of the world's largest cruise vessel, Harmony of the Seas. The cruise ship features engines, propulsion equipment and exhaust scrubber systems and other features from Wärtsilä.

AFRICA'S WAR ON PLASTIC

TEXT: ASHA GOPALKRISHNAN PHOTO: SHUTTERSTOCK

Marine litter is reaching new depths. Almost 85% of this litter is plastic debris. To deal with this heap of a problem, some African nations have waged a war against plastic. Erik Solheim, head of United Nations Environment, tells *Twentyfour7*. what other countries can do to follow suit.

EARLY THIS YEAR, A RARE Cuvier's beaked whale beached on the Norwegian shore. Despite repeated attempts to rescue it, the distressed whale had to be put down. On examination, zoologists found more than 30 plastic bags in its stomach. But this wasn't a one-off case.

A recent report by United Nations Environment states that plastic pollution is threatening at least 600 different species of marine wildlife. While one in three leatherback turtles consume plastic mistaking it for jellyfish, almost 90% of seabirds end up eating plastic when they reach out for food. This is because more than eight million tonnes of plastic – equal to dumping a garbage truck of plastic every minute – end up in the oceans, each year.

"The oceans are getting more and more sick," says **Erik Solheim**, Executive Director, United Nations Environment Programme. "It is estimated that by 2050 the weight of plastic in the ocean will be the same as fish."

A few African nations are marching ahead to solve this problem. Rwanda banned plastic bags in 2008. Its law prohibits the manufacture, use, import, and sale of plastic bags. Mauritania imposed a ban in 2013 and Senegal's National Assembly followed suit in 2015. Uganda, Cameroon, Guinea-Bissau, Mali, Tanzania, Ethiopia and Malawi introduced some form of restriction on the use of plastic bags if not entirely banning them.

Kenya is the most recent entrant to the plastic-ban club.

By one estimate, quoted in *The Economist*, between 2010 and 2014 annual plastic production in Kenya expanded by a third, to 400,000 tonnes. This coupled with the absence of an ef-



ficient waste management system in the country explains why the country's move is significant.

"Kenya is a lot bigger so it may be more complicated. But if political will is mobilised, which I believe it is, Kenya can do it," predicts Solheim.

THAT HOLDS TRUE FOR ALMOST every country because the clean-up costs are staggering. California, Oregon, and Washington, for instance, spend an estimated USD 500 million annually to remove waste from the Pacific coastline. Following Africa's lead could make a difference.

Solheim says it boils down to two things – sustained political will and good tie-ups with businesses. In the wake of the ban, the Rwandan authorities worked closely with companies to create a new market for environment-friendly bags. It made good the losses the plastic bag

manufacturing companies suffered and changed Rwandans' habit of using plastic bags.

This is in sync with the CleanSeas campaign, led by Solheim, which urges governments to pass plastic reduction policies, targets industries to minimise plastic packaging, and urges people to change their habits. Ten countries have already joined the campaign. Indonesia has committed to reduce its marine litter by 70% by 2025, Uruguay will tax single-use plastic bags later this year, and Costa Rica will take measures to reduce single-use plastic through better waste management.

"The campaign will gain momentum by learning from the best practices of a country. If one nation can do it, what's the excuse for another nation?" he asks.

If the oceans could talk, they would say it is a valid question.

[TRENDS & SCENARIOS]

FUTURE PERSPECTIVES



From bytes to beats

How to turn Big Data into music? British DJ **Tom Middleton** produced a song, "Hear the Data", based on Wärtsilä product data, such as the engine speed of a power

plant diesel engine.

Middleton says that the task of turning Big Data into music is not a standard occurrence, nor are there any standard solutions to delivering that technically. "It was a truly unique brief, unlike anything I've ever been involved with, and presented many technical and creative challenges, but ultimately

was so rewarding to have been involved in."

The piece of music was done as a collaboration in Wärtsilä's Digital Transformation launch event in Munich in May.



[CORPORATE CITIZENSHIP]

Our seas are being consumed by litter. But if we can have a trash bin on land then why can't we have one in the water? It was this thought that led to the founding of Seabin, a project that is trying to keep our waters litter-free. Find out how it works and what it means for our seas.

See the video on voutube.com/ wartsilacorp

THIS SUMMER, PEOPLE STROLLING the seaside promenade in Kaivopuisto, Helsinki, could spot a round plastic bin bobbing in the water right next to the pier. The device, called a Seabin, is a floating rubbish can that collects plastics and other unwanted materials from the

"Plastic is such an amazing thing but we've now come to a point when we realise, 'Oh my god, what have we done? We have polluted our oceans with plastics," says Pete Ceglinski, CEO & Co-Founder of Seabin project.

Ceglinski, an avid surfer, witnessed firsthand how trash was taking over the seas.

"It's time to fix the littering problem," he asserts, as he leans over the railing on the pier to look at the newly-installed bin that slowly bobs and sucks in trash from the water.

But Ceglinski wasn't always this concerned about the environment. "I was a product designer and a boat builder. I wasn't helping people or helping the environment. In the back of my head I was always wanting to be a part of some kind of a movement. Then my business partner Andrew Turton told me about this idea. It was something I had always been

Seabin is a simple and feasible solution to clean the seas. But installing Seabins in

marinas is only the first step. The Australian duo have bigger plans in store.

IN CEGLINSKI'S VISION, the plastics collected from the Seabins will be reused – think t-shirts, baseball caps and sunglasses. Perhaps the next generation of Seabins will be made of plastics gathered by the bins. One option would also be to make fuel using the material.

This is where association with companies like Wärtsilä weigh in more heavily.

Wärtsilä is Seabin Project's global pilot partner for the next three years. During the partnership programme, Wärtsilä has already donated two floating rubbish bins to the City of Helsinki and the Port of Helsinki. Another bin was installed in Turku on the Western coast of Finland to test how the bin works in a river.

"We thought it would be great to have some smart people working with us," says Ceglinski with a smirk as he talks about the collaboration with Wärtsilä.

While the initial phase aims to collect information from the partners on the specifics of trash collected in the bins - how much trash gets accumulated over what period of time, what kinds of plastics make up the trash, what other materials wash up, etc. - going forward there's scope to improve the product and

spread the knowledge. Partners like Wärtsilä will invite schools and groups to visit the bin and make their own projects.

"There are a lot of people with great ideas who don't have the resources, and there are these large companies that can help. It's like the bigger brother helping out the little brother."

Ceglinski believes that the future will see a lot more collaborations with small groups and large corporations alike.

THIS AUTUMN, SEABINS WILL also be for sale. Ceglinski hopes that in the coming years, marinas around the world will have floating trash cans to keep the unwanted elements out of the water. However, he believes the bins themselves are not the final solution. People, in general, have a role to play in keeping are waters clean.

He is of the opinion that people should take action, even if it means picking up a plastic bottle when going to the beach or opting for non-packaged foods at the grocery store. Every small effort matters.

"It all comes down to changing our ways of thinking," says Ceglinski. He takes one last look at the bobbing bin and spots something.

"Look at that cigarette butt going in!" he says with excitement. The seas' trash bin is at work.

TEXT: LOTTA HEIKKERI PHOTO: WÄRTSILÄ

Finding a purpose in the big picture

AN OLD NUISANGE FROM THE PAST – protectionism – has raised its ugly head, recently. For several decades, politicians have been hard at work to eliminate trade barriers, and for a while we were well on our way to creating a truly open world. It's a shame that the world is now moving in the opposite direction.

For a global company this raises concerns. Especially for a company that is in the business of propelling world trade. But protectionism is a problem on a much larger scale, too. Free trade and globalisation have raised millions of people above the poverty line, and this is naturally a development we do not want to see stalled.

MANY OF OUR CHALLENGES – such as climate change – are global in nature, and we need to work together to solve them. We are at the tipping point of technologically solving the problem of providing affordable and clean electricity for everyone. We have the technology to make use of renewable energy and can provide the backup power needed. Furthermore, emissions can be curbed more effectively than ever before. Open innovation has played and will continue to play a paramount role in this development.

AT WÄRTSILÄ WE SEEK INSPIRATION and help from our customers, educational institutions, the society, and even our competitors - as healthy competition can be a great source for inspiration.

From a corporate point of view, protecting your own turf might give you a higher return in the short run. But it is a poor strategy for creating longstanding results. To excel in the long run, you need to care about the big picture. In this respect, a deeper vision will guide you towards solutions that will benefit generations to come.

Our purpose at Wärtsilä is to 'enable sustainable societies with smart technology'. Our business is right at the core of making everyone's life better through affordable and clean energy, and making sure people and goods reach their destination with minimal impact to the environment. Seeing our role in the big picture and working towards a better society gives us direction at work, every day. But we can't fulfill this completely on our own, and therefore collaboration and openness will always be on our agenda.

JAAKKO ESKOLA

President and CEO of Wärtsilä Corporation

MOST OF OUR **CHALLENGES** ARE GLOBAL IN NATURE. AND WE NEED TO WORK TOGETHER TO SOLVE THEM. Twentyfour 7. 2.17 15

PHOTO: WÄRTSILÄ

The state of South Australia has beaten the country's 2020 target for renewable energy. But last summer, its power system failed to meet peak demand and left tens of thousands of Australians in the dark.

What went wrong? And how can it be fixed to make sure air conditioners run during sweltering Australian summers in the future?

WHEN THE LIGHTS



"LUCKILY WE COOK WITH GAS AND KEEP ICE FOR STORING OUR FOOD SUPPLIES, OTHERWISE IT WOULD HAVE BEEN IMPOSSIBLE TO CARRY ON IN THE DARK."

Adam Nguyen runs a restaurant that has struggled with power blackouts.





Since the tills at the Co-Op bookstore weren't working, Jasmin Searle was forced to close down the store for the day.



dam Nguyen manages the family-run Vietnamese restaurant, Phonatic, in South Australia's capital city, Adelaide. The power blackout late last year took him and his staff by surprise.

The restaurant was flooded with hungry customers, recalls Nguyen. "Luckily, we cook with gas and keep ice for storing our food supplies; otherwise it would have been impossible to carry on in the dark," he points out. Nguyen says his team managed to make the best of the situation, though.

"We lit candles, and our customers got to enjoy a candlelit dinner," he remembers. The power finally returned after hours of darkness and Nguyen did not close the doors until 1 am, which made the blackout an unexpected success story.

Jasmin Searle, who was working in the Co-Op bookstore at the University of Adelaide campus during the blackout, has a different story to tell.

"We had to ask the customers to leave and close the store because the tills were no longer working. It was easier said than done because the automatic locking system on the doors was not working either. I had to tie the doors shut to secure them," says Searle.

Several such stories emerged from different parts of South Australia that fell prey to power blackouts late last year. This was triggered by strong tornado winds, which damaged transmission lines and led to prolonged blackouts.

The problem lies in the fact that the electricity network

in South Australia (sA) is connected to the neighbouring state of Victoria and further to the National Electricity Market (NEM), which runs from sA to Queensland along Australia's east coast, but the interconnectors have limited capacity. That's why the Heywood interconnector turned off when the imported power increased during the storm. As a consequence, the South Australian network was unable to sustain system frequency and more than 800 000 people without electricity. This incident has pushed many to re-examine the country's energy mix and the security of the supply.

GETTING THE ENERGY MIX RIGHT!

Australia's share of renewables is growing. While solar accounts for 3% of the total supply, wind energy makes up roughly 40%, making it the country's preferred choice of renewable. Around half of all the wind farms in the country are located in South Australia.

What makes South Australia a peculiar case is that there are no coal-fired plants left in the state – only gas plants remain. The baseload generation relies entirely on gas and power from the neighbouring state of Victoria through two interconnectors.

The Chief Executive of the Australian Energy Council **Matthew Warren** views the situation in sa as a lesson for both Australia and the world. Not a lesson in why to shy away from renewables but rather to commit to the changes required in the grid and energy market.



"Gas is basically running negative in relation to wind. When the wind isn't blowing we need lots of gas, and when the wind is blowing in South Australia we don't need so much gas. We need very liquid gas markets to enable the gas generators access because they are not running constant base load. It is imperative because otherwise the overall cost of the system relying on renewables will be higher," says Warren.

Despite the big support for renewables the current energy mix was not meant to be so heavily reliant on them, according to a report commissioned by the Australian Energy Council. The report states that when the renewable energy targets of reaching 20% renewables by 2020 were originally put in place in 2009 there was an understanding that they would be paired with an emissions trading scheme. The scheme fell through and led to a situation that the power system wasn't prepared for.

"The way we run the National Electricity Market is very well designed and elegant, but it is being disrupted by a lot of schemes and incentives. The renewable energy targets encouraged building the lowest-cost renewables, regardless of the location and connectivity to the grid for stability issues. Having all that renewable at the far end of the NEM doesn't make much sense form a grid stability perspective" says Warren

Immediate fixes for the situation in South Australia would, according to Warren, revolve around the safety protocols that shut down the power in September and making sure all the supply is available in case of peak demand during summer.

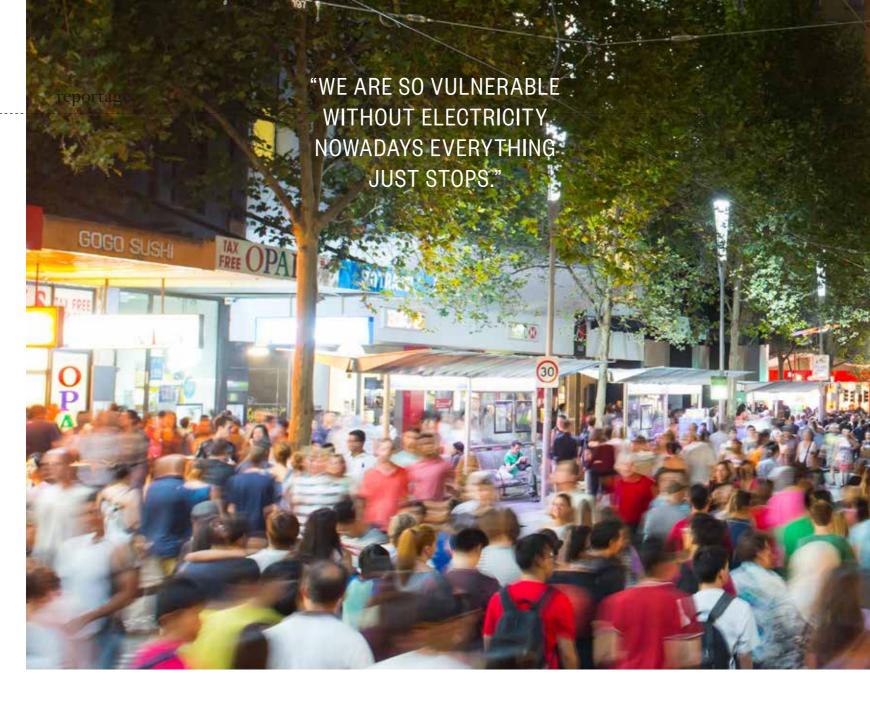
According to the Australian Energy Market Operator (AEMO), there is sufficient capacity to meet national demand despite the recent mothballing of coal-fired plants in South Australia and Victoria.

STEPS TOWARDS CHANGE

Australians have seen a long line of suggestions on what regulations would be most efficient and which investments would give the highest level of security in the future. A proposition that drew much attention was the one made on Twitter by Tesla-founder **Elon Musk** – to provide a grid scale energy storage within 100 days. Following a bidding process, Tesla was awarded the contract to provide a 100 MW/129 Mwh Powerpack system to be paired with global renewable energy provider Neoen's Hornsdale Wind Farm near Jamestown, South Australia. Upon completion, by December 2017, this system is expected to provide enough power for more than 30,000 homes, approximately equal to the amount of homes that lost power during the blackout period.

Among the measures the South Australian government

"THE WAY WE RUN THE NATIONAL ELECTRICITY MARKET IS VERY WELL DESIGNED AND ELEGANT, BUT IT IS BEING DISRUPTED BY A LOT OF SCHEMES AND INCENTIVES."



has announced in the wake of the blackout are introducing legislation that gives the South Australian Energy Minister the authority to request power generators be turned on when needed and a requirement that a minimum of two synchronous generators be in operation at all times within the South Australian power system.

According to M. Rajagopalan, Market Development Director for the Middle East and Asia, Wärtsilä, what could further improve the security are solutions that can both capture and prevent spikes in demand.

"Our simulations of scenarios with spikes in demand have shown that adding quick dispatch plants could provide significant savings," says Rajagopalan.

Wärtsilä creates energy solutions and has found similarities between the Australian and other energy-only markets such as California and Texas in the USA. The modern energy systems face a dilemma of competing priorities: sustainability, cost and reliability. Wärtsilä's Smart Power Generation plants were designed specifically to complement renewable energy sources. The dispatch time is five minutes, which allows for preventative action. The plants also offer options on fuel. They run both on gaseous and liquid fuels.

"Building a Smart Power Generation plant is quicker than

building traditional plants, about 14 months from scratch to commissioning. Additional capacity can be augmented by adding new modules as demand grows," notes Rajagopalan.

Through the July acquisition of Greensmith, a us-based energy storage integrator and Energy Management System supplier, Wärtsilä has now also in-house capabilities to offer grid scale energy storage solutions and also hybrid solutions, like engines and storage.

Changes on the Australian energy grid will take time. But for now, there is an ongoing review about the future of the National Energy Market, where most efficient solutions will be determined on the basis of cost, efficiency and delivery times.

While those pressing decisions are being made, residents of Adelaide and the rest of South Australia are hoping to get through next summer without more power outages. The measures taken by the regulators and industry will be tested in January when temperatures will soar yet again.

Nevertheless, businesses are buckling up and preparing for whatever that may come their way.

"I am considering installing a generator for next time. We are so vulnerable without electricity nowadays everything just stops. Hopefully it doesn't happen again - but we'll be ready for it," says Nguyen.





The city of Adelaide has been suffering from power blackouts.





"EVEN SMALL CHANGES IN OPERATING CONDITIONS CAN LEAD TO SUBSTANTIAL CHANGES IN **ENERGY CONSUMPTION."**

he sight of ships sailing in open seas has captivated mankind for generations. In the face of rapid improvements in land and air transport, shipping remains the most efficient means by which goods can be transported across the globe. But this comes at a cost, in terms of emissions.

Shipping emissions have risen considerably, compared with other sectors, forming about 3% of total global emissions. To control this, the International Maritime Organization (IMO) - the global watchdog for the sector - has introduced 2 yardsticks. One, the Energy Efficiency Design Index (EEDI), which mandates improvements in design, and second, the Ship Energy Efficiency Management Plan (SEEMP), which requires ship owners to have a plan for improving the operational energy efficiency of their existing fleet.

Tomas Hakala, Vice President, 4-Stroke Engine Services, Wärtsilä, says the move was inevitable and that ship owners have recocnised the need for it.

"Owners are already taking these requirements into consideration when designing the new vessels. Of course, there are challenges in the form of additional workload and costs to make them compliant with the new regulations. But the reaction in the industry has been positive," he says. In end of June, Wärtsilä and other industry players formed a pact, under IMO, to jointly develop energy efficiency in shipping.

The willingness to adapt to these new regulations is easier to understand when one considers the current state of the industry, says Giampiero De Cubellis, General Manager, Sales Support Development & Projects, Wärtsilä Services.

"The challenge in the market is clear. If revenues are going down, there is only one way to be successful: to really think about how every single gram of your fuel is utilised on board and how you can get the maximum out of it and this means energy efficiency."

FROM NEW DESIGNS TO UPGRADING EXISTING FLEETS

So, what kind of concrete action is the industry taking to achieve its energy efficiency goals? Let's look at the cruise and ferry industry, one of the fastest-growing sectors in tourism. It attracted nearly 22 million passengers in 2015, growing at an annual rate of 8% over the past 15 years.

For new ships, ship owners and operators are using more energy-efficient hull designs, while adopting hybrid and diesel-electric propulsion systems. But these measures are



"THE ONLY WAY TO BE SUCCESSFUL IS TO RETHINK THE **CONCEPTS OF** MANAGING SHIPS **BASED ON THE** MARKET REALITIES."

cost-intensive and it will take time for these new ships to hit the water. In the meantime, industry experts are advocating the more cost-effective option of upgrading existing fleets and making improvements to its operations and maintenance.

"Even small changes in operating conditions can lead to substantial changes in energy consumption. Potential areas of efficiency improvements include time spent in port, economical voyage planning, weather routing, active speed optimisation and maintenance choices that look at the best economical lifetimes of components rather their maximum technical lifetimes," explains Hakala.

Digital technologies are the key to executing this successfully, helping ship owners and operators make informed decisions about their equipment. Thanks to Internet-of-Things (IoT)-related technologies, smart maintenance solutions now enable you to predict when your machine will break down. This combined with the use of upgrades has seen cruise and ferry ships improve energy efficiencies rapidly.

The case of the cruise ferry ship Viking Grace operated by Viking Line is a good example of how to improve energy efficiency. For instance, grids have been installed on the vessel's bow thrusters, reducing hull resistance by 3.5%, while hardware solutions including speed controls have been introduced on different pumps and ventilation systems to improve their efficiency. Other energy-saving features that have been installed include storage of waste heat and its subsequent conversion to electricity, and LNG heat recovery.

A HOLISTIC APPROACH

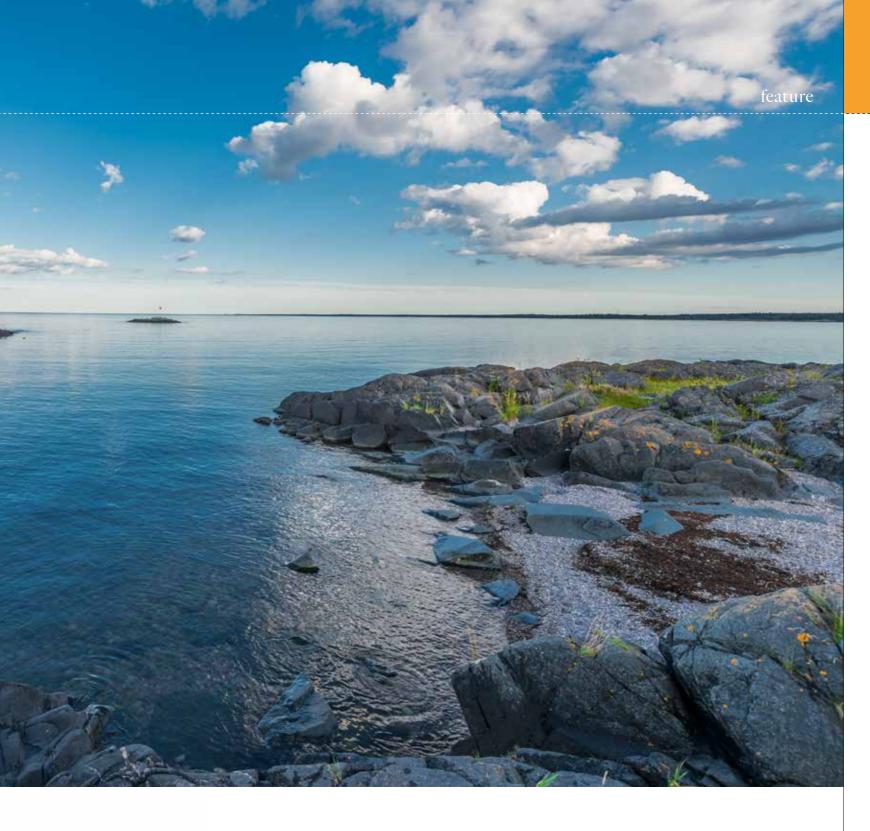
Meanwhile, the merchant shipping sector is dealing with similar challenges, with the added challenge of trying to rationalise costs. The sector has had to deal with continued overcapacity in the existing fleet, which in turn has driven down freight and charter rates. The only solution for ship owners and operators is to cut costs by improving energy efficiency.

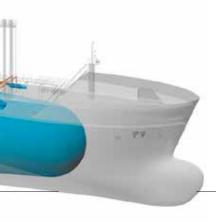
"There is only one way to be successful today, to really rethink the concepts of managing ships based on the market realities that these new rules and regulations have brought in," explains De Cubellis.

Merchant ships are moving towards the installation of LED







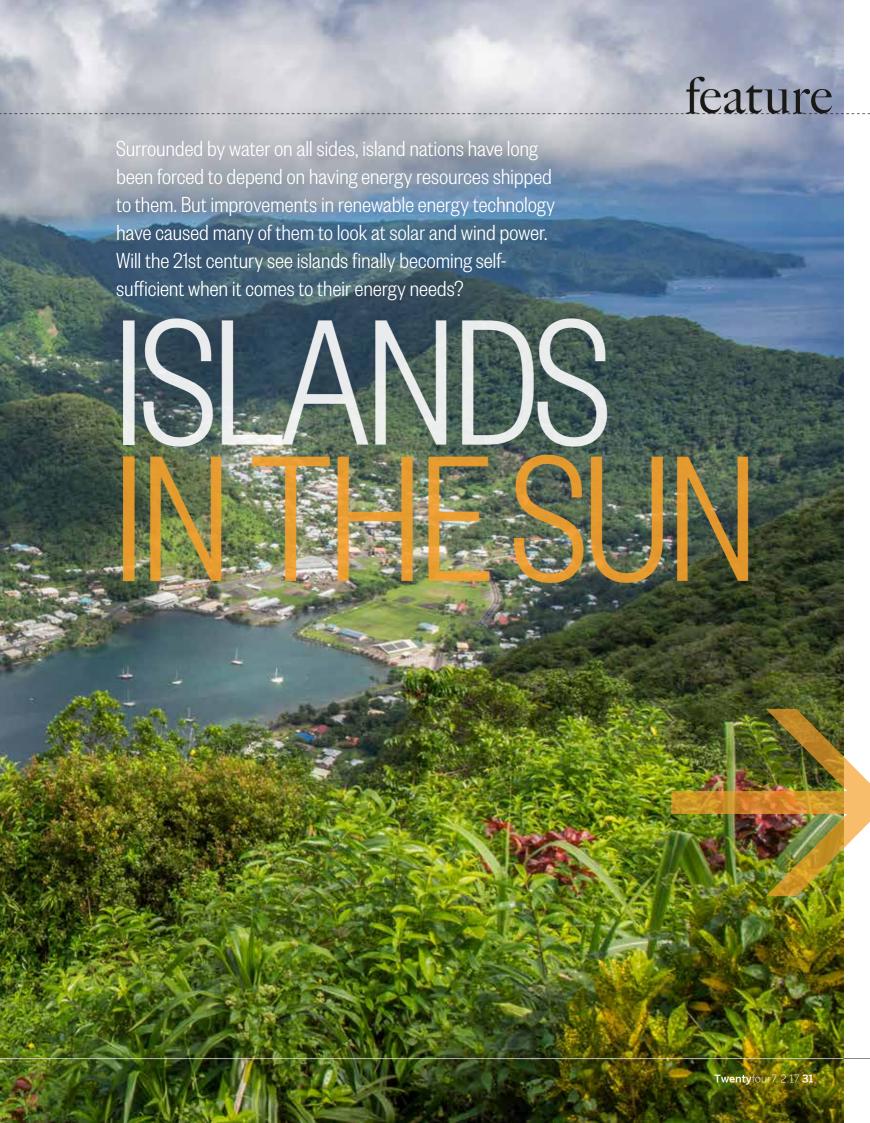


lighting and better management of the propulsion system and power distribution to help reduce power consumption. Additionally, smart technologies are being used to continuously monitor the vessel. The data is then analysed, helping engineers identify specific upgrades that can improve the efficiency of the vessel.

Take the case of Gaslog LNG services, an operator of liquefied natural gas carriers. The company has over the past three years, managed to reduce its Energy Efficiency Operating Index by 30% by adopting a series of solutions like optimised hull forms, more efficient propulsion systems like the latest Wärtsilä X two-stroke dual-fuel engine and utilising cleaner fuels. The company also fine-tunes its systems constantly to find new areas where it can improve efficiencies. This holistic approach, says De Cubellis, is essential if the new rules are to be met.

"The strength in Wärtsilä has been a combination of all these factors, to present customer solutions which really match the customer need. To do this, we are asking questions first, acting like consultants while helping them get the maximum out of their existing equipment. We only propose essential changes with a clear budget and a clear return on investments made at that point of time," he explains.

With everyone scrambling to meet these new regulations, the search for new ways and means to improve energy efficiency will dominate the maritime industry in the years to come. And the companies that are the first to crack the code may well end up garnering the lion's share of the market while contributing to a cleaner environment.



alk about American Samoa and chances are that long beaches, epic waves, and sumptuous seafood are what comes to mind. Set in the centre of the South Pacific Ocean, this archipelago is a favourite among tourists looking to get away from it all. And until late last year, the T'au island in American Samoa was wholly dependent on shipments of diesel fuel to generate power.

But in November of 2016, a new solar-powered micro grid was developed, allowing the island to embrace solar power for all its energy needs. A system of over 5,300 solar panels was installed on seven acres of land, generating about 1.4 megawatts (MW) of energy which has provided the 600 residents living there with all the power they need.

PAVING THE WAY TOWARDS CLEAN ENERGY

While the desire to adopt clean energy is a big motivation, challenges in maintaining a regular supply of fuel shipments, coupled with high costs, are big factors influencing the push towards renewable energy sources, explains <code>Jyrki Leino</code>, Senior Power Systems Analyst, Business Development at Wärtsilä Energy Solutions.

"In islands, the costs of importing fuel can rise due to special shipping arrangements and constraints. Generally, diesel

is the most expensive, followed by heavy fuel oil (HFO). Lique-fied natural gas (LNG) is the best alternative, but building the infrastructure for it can be time-consuming and expensive," says Leino. "On the other hand, solar power costs are coming down every year, and wind power technology is improving and windmills have been performing better even in low wind conditions. Comparing the output and costs to conventional means, it makes sense for islands to look at renewable energy sources."

As a result, efforts are underway in Hawaii, the Cook Islands, the Caribbean and other island communities across the world to shift focus from fossil fuels to renewable energy sources, including wind and solar energy. However, the shift towards clean energy is not without its share of challenges, chief among them being its intermittent nature. For instance, solar power may not be at sufficient levels during cloudy days, and wind power generation can stall on days when the wind is not strong enough or dies down. Plus, points out **Risto Paldanius**, Director, Energy Storage at Wärtsilä Energy Solutions, not all islands are suitable for renewable energy solutions to be built.

"You need large surface areas for installing wind or solarenergy solutions, something in the range of 0.5 to 2 hectares per MW being produced. And this surface should be as level as





Solar installation in American Samoa.





possible. Small islands generally don't have too much of that kind of space," he says.

CAN HYBRID ENERGY SOLUTIONS HELP?

This is a particularly daunting problem for islands, considering that they are not connected to the mainland, which means they cannot rely on other energy grids to make up for any shortfall. One way to guarantee a stable grid is to use hybrid energy solutions.

For instance, islands deploying solar energy can consider using utility-scale hybrid power plants where solar power is complemented by an engine unit that runs on oil, natural gas or biofuel. These plants can run on solar power when available and switch to the engine unit during the night or during overcast days when solar energy is not as plentiful.

"Another solution is to look at right-sized, optimised storage," points out Paldanius. These storage solutions allow islands to store excess power, to be used when solar or wind power has died down. Companies like Wärtsilä have taken this a step further, using technology to develop smart energy management systems for islands.

"We offer energy management systems through our newly acquired company, Greensmith Energy," says Paldanius. "We can also include weather forecasting, so that we know how much sunlight would be available tomorrow. This gives us a good idea of how much engine is going to be operated and we can optimise the utilisation of energy storage accordingly. It helps us to optimise the energy system well in advance, thus helping also to keep the energy grid stable."

"IN THE ISLANDS, YOU CANNOT BORROW OR BUY ENERGY THAT EASILY, BECAUSE YOU ARE ISOLATED."

All eyes are now on how successfully these islands use these smart technologies to switch to renewable energies.

"Typically, most countries have so far relied on borrowing energy from neighbouring grids or buying it outright from other countries when needed. In the islands, you cannot borrow or buy energy that easily, because you are isolated," Leino explains. And the way in which they solve the problem will hold major learnings for countries on the mainland that are struggling to move away from fossil fuels.

In the meantime, with renewable energy technology continuously improving, the costs and infrastructure needed to install renewable-energy grids on islands are coming down with each passing year. The next three decades may very well see islands leading the way towards 100% adoption of clean energy. •

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GROWTH IN ORDERS AND NET SALES IN THE FIRST HALF OF 2017

TEXT: NATALIA VALTASAARI

Wärtsilä's net sales developed well in the first half of the year, thanks to the higher number of power plant deliveries, while earnings were solid. Order intake development was good in all business areas, supported by increased demand for service agreements, a solid pipeline of power plant projects and a favourable vessel contracting mix.

STABLE DEVELOPMENT IN SERVICE MARKETS

In the marine service markets, healthy activity in cruise and gas carriers compensated for continued challenges related to the offshore and conventional merchant segments. The demand for power plant related services was steady. Services' net sales was stable at Eur 1,035 million in the first half. Order intake, on the other hand, increased by 16% to Eur 1,285 million, thanks to the increasing demand for long-term agreements in both the marine and energy markets. Significant orders included a 12-year performance-based service agreement signed with Carnival Corporation in January. The agreement strengthens Wärtsilä and Carnival's existing partnership and joint continuous improvement efforts to maintain the highest possible levels for cruise ship safety and reliability.

POWER GENERATION MARKETS SHIFTING TOWARDS FLEXIBLE TECHNOLOGIES

The demand for Wärtsilä's power generation solutions was good in the first half of 2017. Electricity demand in the emerging markets continued to increase, and the growing share of intermittent renewable sources in several developed markets drove investments in flexible generation capacity. The power plant project pipeline has continued to materialise into orders at a healthy pace, thanks to the growing interest in flexible, gasfired technologies. Energy Solutions' order intake increased by 24% to EUR 766 million in the first half of the year. Ordering activity was strongest in Asia, with received orders including several equipment deliveries to Indonesia.

In May, Wärtsilä announced the acquisition of Greensmith Energy Management Systems Inc., a US-based leader in intelligent energy storage technology and solutions. The acquisition of Greensmith enables Wärtsilä to expand its footprint in the energy storage market and position itself as a leading global energy systems integrator. When Wärtsilä engine plants are further optimized with energy storage, new sources of value can be offered to customers and partners. Also, the growing capacity of renewable generation, including solar PV, becomes more sustainable and attractive when integrated with advanced energy storage. In the developed markets, Wärtsilä received orders for two 50 MW power plants from the UK, as well several equipment order from the USA.

MARINE SOLUTIONS DEVELOPMENT SUPPORTED BY FAVOURABLE VESSEL CONTRACTING MIX

During the first half of 2017, 376 contracts for new vessels were registered as compared to 378 during the corresponding period in the previous year. Despite some signs of a gradual recovery in demand, the marine industry continues to be burdened by weak utilisation levels, overcapacity, low freight rates, and low oil and gas prices. Nevertheless, contracting activity remained on a good level in niche vessel segments, such as cruise, ferry, special vessels and Ro-Ro. Marine Solutions' order intake decreased by 2% to EUR 725 million in the first half. Continued activity in the cruise markets and in certain gas applications, supported Marine Solutions' orders received particularly in the second quarter during which order intake grew by 11%. Significant orders received during the first six months of the year included the supply of dual-fuel main engines and regasification technology to two new LNG carrier vessels being built for Höegh LNG at the Samsung Heavy Industries and Hyundai Heavy Industries shipyards in Korea.

OUTLOOK FOR 2017

Looking ahead, Wärtsilä anticipates demand by business area is to develop as follows. The service demand outlook

remains solid with growth opportunities in selected regions and segments. The outlook for Energy Solutions was raised from solid to good in the first quarter. Increasing electricity demand in the emerging markets and the global shift towards renewable energy sources is expected to support the need for distributed, flexible, gas-fired power generation. During the second quarter, Wärtsilä raised its full vear demand outlook for Marine Solutions from soft to solid, thanks to a favourable vessel contracting mix. The general marine market environment remains challenging, as the merchant, gas carrier, and offshore segments continue to suffer from overcapacity, slow trade growth, and the financial constraints of customers.



THE SKY'S THE LIMIT

The kingdom of Morocco is leading the energy transition in North Africa. It is emerging as the one of the world's largest solar power producers and says it will have 52% of its energy supply through clean sources by 2030. Is this target achievable?

even years ago, the King of Morocco announced the launch of a mega solar plan in the kingdom. That move was expected to steer the national energy policy of the country in favour of renewables. This was a tall order for a country, which is the only place in North Africa with no fossil-fuel reserves for power generation.

This was a country that imported more than 90% of its energy demand that was growing between 5-7% annually.

The mega solar plan, like Morocco itself, seemed picture perfect. It would help reduce the country's dependence on energy imports and its ballooning trade deficit and help it control climate change due to high CO2 emissions.

The big question was whether the plan would really see the light of day, considering that the country had no expertise and technical know-how in the field at the time.

These doubts were to put to rest last year when Morocco inaugurated the first phase of the world's largest concentrated solar plant, Noor Solar Complex in Ouarzazate. The 160 MW plant is a small part of a USD 9 billion multi-phased project, which will be completed by 2018. Noor Solar Complex is expected to generate 580 MW of power and it is said that it will be as big as Morocco's capital city, Rabat.

"It can be said that the solar plan constitutes for King Mohammed vI what the hydraulic plan has constituted for his father King Hassan II in the 1960s. This has given more credibility to the programme," says Driss Zelji, Former President of the Moroccan Society of Renewable Energy Development (SMADER) and Professor at ENSA Kenitra.

TILTING THE BALANCE OF POWER

This top-down approach and technical, economic and political will have powered Morocco to march ahead with its renewables plans. It has a target to raise renewables from 34% of installed capacity in 2015 to 43% of installed capacity by 2020 and 52% of installed capacity by 2030. By 2020, Morocco will generate 2000 MW each through its solar, wind and hydro energy



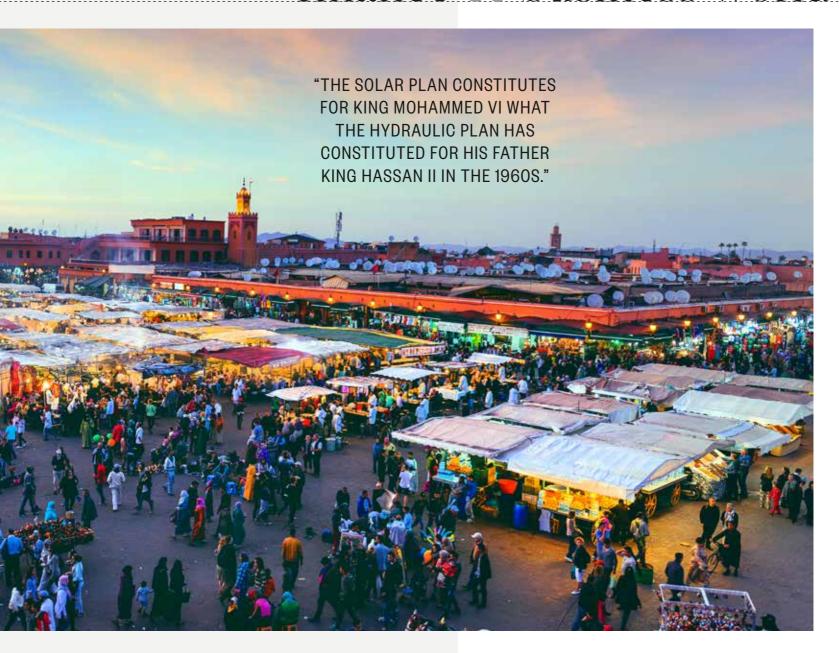
programmes spread across Ouarzazate, Ain Beni Mahtar, Laavoune, Boujdour and Tarfaya, Midelt, Tiskrad, Tangier, Jbel Lahdid, and Boujdour.

Morocco will also expand its overall energy capacity of 8.26 GW by 1.7 times to 14 GW by 2020 and by three times to 25 GW by 2030. To achieve these targets it is also investing in new coal plants, new gas power projects and new interconnections with Spain, Portugal, Algeria and Mauritania.

This is a big opportunity for global energy companies like Wärtsilä that are looking to expand their presence in Morocco. Wärtsilä has implemented, maintained and supported five EPC projects of a total 160 MW with energy utility major ONEE.

Jérôme Jouaville, Business Development Manager - Africa, Wärtsilä Energy Solutions, says, "We are especially looking at the new gas to power project (bringing LNG as an alternative fuel by building a large LNG terminal) that will include 2400 MW of additional capacity of gas plants to enable the integration of renewables in the country."

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To tilt the balance of power in its favour, Morocco is ensuring that there is sufficient support for its transition to renewables. It is laying equal emphasis on a social and cultural switch in favour of clean and green energy.

For instance, last year, nearly 100 mosques in the region went green by installing LED lighting, solar thermal water heaters and photovoltaic systems. The target is to create more awareness and have green energy in more than 600 mosques by 2019.

THE HEART OF THE MATTER

As Morocco races ahead to reduce its dependence on imports, a large part of its energy security hinges on how well the renewables story plays out. Experts believe that the optimism about a smooth transition may be overstated.

Zelji points out "In all transitions, humanity has never substituted an energy source with another; we have always experienced an energy mix that became larger and larger."

It is estimated that even if Morocco meets its target of having more than half of the energy supply from renewables by 2030, it may correspond to just 25–40% of electricity, given the low capacity factor of renewables plants in comparison with conventional ones.

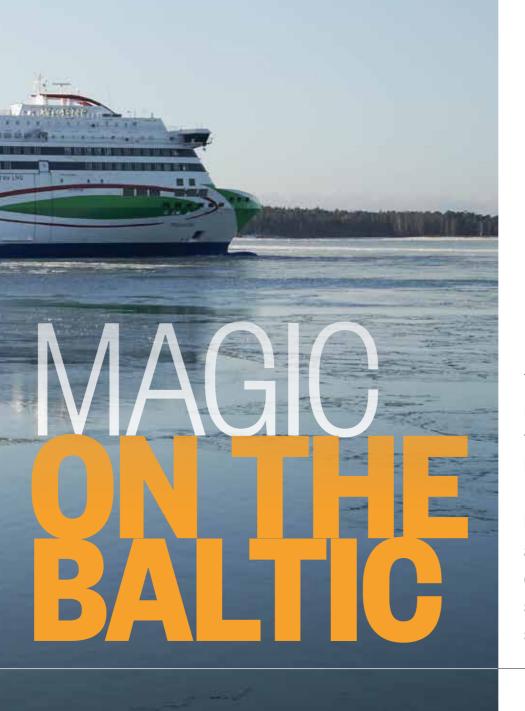
"The challenge is to find solutions to increase the percentage of generated electricity from renewables without compromising the grid and the security of the supply", says Jouaville.

Despite these challenges, investors are backing Morocco's ambitious plans. Over the last two years it has seen investments in renewables touch a whopping USD 1.8 billion, from almost no investments in 2014. According to a report by Ernst & Young, Morocco is now amongst the world's top 15 most attractive renewables-oriented investment destinations.

As it aggressively moves ahead to meet its climate pledge, Morocco, the COP22 host, is changing the landscape of Sub-Saharan Africa. For now, it does seem as if the sky is quite literally the limit.







The MS Megastar, the new Tallink shuttle that ferries passengers between capital cities of Helsinki and Tallinn, is both technologically advanced and uniquely designed. We give you a sneak peek of what's in store aboard this vessel.





two-hour voyage to Tallinn, the capital of Finland's Baltic cousin, Estonia, is on the itinerary of many overseas tourists. And needless to say, it's almost a summer or pre-Christmas ritual for Finns to do the same. But starting this year, passengers are going to be in for a big surprise.

The launch of the Ms Megastar on this ferry route early this year may well be the start of a new era in Baltic travel. That's because powered by Wärtsilä 50DF dual-fuel engines that run mostly on liquefied natural gas (LNG) and steered with the support of Wärtsilä navigation systems, the Megastar is one of the most modern, state-of-the-art vessels currently traversing the Baltic.

It is the first vessel in the Tallink fleet to carry the Nacos Platinum Integrated Bridge System, which simplifies and streamlines controls and monitoring on the bridge of a ship.

"Nacos stands for Navigation & Automation Control System," says Alexander Vehrenkamp, Sales Manager, Systems & Solutions, at Wärtsilä Electrical and Automation. "It's a system platform featuring common hardware, software and human machine interface for multiple applications. Unlike older and competing systems, our Platinum Technology is based on an interface for all relevant system components, allowing reliable data flow and flexible system arrangement."

The "Platinum" tag denotes the sixth generation of Nacos systems, which has its roots in requirements started by Finnish ferry operators, decades ago. "This heritage, in combination with constant innovation, is the reason why Nacos Platinum is often the first choice when it comes to complex navigational tasks," he notes.

THE ADDED BENEFITS

That's not all. Mika Ojutkangas, General Manager, Wärtsilä Marine Solutions, points out that although the vessel operates at a very high speed, Wärtsilä has managed to provide propellers with record-breaking efficiency. "The ice class makes this efficiency an even bigger achievement since this usually presents a challenge." This is because thicker and stronger materials are needed for tackling the Baltic's potential winter ice conditions.

Given the fact that Wärtsilä has signed a five-year maintenance agreement with As Tallink Grupp for the Megastar, which covers maintenance and optimisation of the ship's engines, as well as the supply of spare parts and round-theclock online support, there is little to worry about. With continuous monitoring and Wärtsilä Condition Based Maintenance service of the engines, passengers can enjoy their voyage without any unexpected interruptions.







FROM TECHNOLOGY TO DESIGN

To make the experience comfortable and seamless also within the vessel, the operators as Tallink Grupp commissioned the leading Finnish interior design company dSign Vertti Kivi & Co to create the ship's interior environment.

"We are known for strong ambience design, and our clients tend to hire us when they are looking for totally new, disruptive ideas in the field," says designer Vertti Kivi, who notes this was the first time they designed interiors for a journey that only takes two hours.

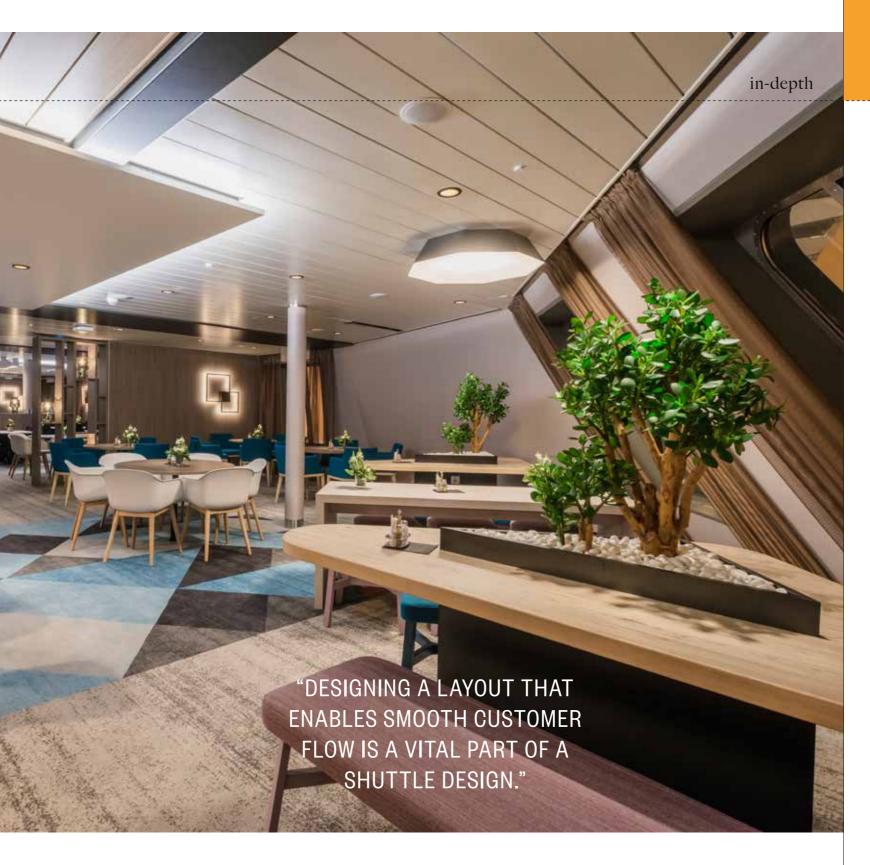
Kivi says their brief was to design the ship based on Tallink's

customer feedback, which revolved mainly around functional matters. That's because in the case of a ship, the crew must take into account functional requirements and ensure that everything works efficiently from one voyage to another.

"There are many ways to facilitate work and ease the crew's stress through design, which naturally affects the customer experience too," he explains.

"Designing a layout that enables smooth customer flow is a vital part of a shuttle design."

But Kivi's team wanted to work on the look, feel and atmosphere of the vessel, as well, because they were struck by the low



expectations expressed by customers in the feedback.

"So we decided to surprise them," recalls Kivi. dSign contributed the designs for the entrance lobby, all the restaurants, a children's playroom and the Comfort and Business lounges.

In the lounge areas, dSign used light, serene colour schemes and furniture with an especially tactile appeal. A similar attention to eye-catching detail is displayed, for example, in the Victory bar, with its unique wall lamps, and the wooden surfaces and bright carpeting of the Delight buffet restaurant.

Passengers are welcomed by a feeling of excitement and tempting views towards different spaces. The aim was to create

an overall sense of calm and ease of movement not always associated with Baltic ferries, without sacrificing the sense of every voyage being a special occasion.

"The owners of the vessel seemed pleased. In fact, they said that they are afraid that the Megastar is going to set new standards for shuttle cruise ship travel!" says Kivi, beaming with pride.

Guided by the most reliable navigation system available – using the most fuel-efficient engines with the lowest emissions on the Baltic – the vessel promises to give passengers an experience like no other. That's definitely more than one reason to hop on board.









At the state-of-the-art premises of Wärtsilä's Fuel Laboratory Services, researchers explore novel fuel flexibility options.

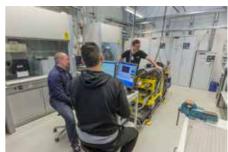
he small coastal city of Vaasa in western Finland might seem like an unlikely location for a specialist scientific laboratory. But the quiet and important work proceeding here has far-reaching results affecting everyday life. This is the hub of Wärtsilä's Fuel Laboratory Services, part of the Energy Solutions division and an expert pioneer in gaseous and liquid fuel know-how.

If you are wondering how this could possibly affect your life, consider the very topical and increasingly urgent issue of plastic recycling. There is a pressing global need for innovative solutions to reduce

the use of plastics, especially to halt the disruption caused by plastic waste to vulnerable ocean ecosystems. New technology that reclaims the fuel content of plastics is gaining credibility as one solution to this challenge, and the Fuel Laboratory is playing a role in its development.

"Our experiments deal with the kinds of plastic that can't be reused anymore," says Senior Development Manager Olai Lagus, who is the lab's customer contact related to fuel chemistry and one of a team of nine lab staff in the Vaasa area. "If a plastic is contaminated with other kinds of plastic, there aren't any







other ways to recycle it. Another similar project we are involved in is with a customer in Cyprus who is interested in the potential for reclaiming fuel from car tyres. We have been carrying out the testing and piloting for this customer."

STATE-OF-THE-ART COMPETENCE

The kind of fuel flexibility explored by the lab, says **Tommi Rintamäki**, General Manager, Fuel Laboratory Services, is a fundamental part of Wärtsilä's Smart Power Generation value proposition.

"The lab was established in 2009 as part of our Power Plant Technology activities," he explains. "The daily work relates mainly to sales and after-sales support on various liquid or gaseous fuel-related questions. Over the years, the lab staff have developed a state-of-the-art competence in chemical and combustion analyses related to engine power plants. The work involves various combustion and fuel analyses rather than engine testing as such."

The lab's portfolio lists several customer cases involving fuel oil manufactured from waste tyres and plastic, and it includes a range of locations and other fuel industry applications.

"Recently, a customer in Mauritania was suffering

from operational problems which were identified with our support to be caused by a heavy fuel oil containing too many impurities resulting in filter clogging," says Rintamäki. "Right now, in Japan there is a lot of focus on liquid biofuel development, in relation to which dozens of fuel analyses have been carried out in our laboratory to support the end customer's fuel supplier selection."

SUPPORTING DECISION-MAKING

Lagus is keen to point out the advantages offered by the Fuel Laboratory compared with other industrial labs. "In Wärtsilä's case, we are able to look into the reasons behind the test results and offer conclusions about how to proceed," he says. "From a standard lab, you usually just get the numbers and results, but we have developed that extra ability to draw conclusions. If we observe a phenomenon, we have the capacity to look into it and go further to help solve a problem. This advantage is definitely a competitive edge."

"Much of our daily work is today channelled via the sales and after-sales organisation to serve endcustomer needs," says Rintamäki. "We are starting to create more direct business contacts with existing and potential new customers." An example of the lab's latest novel equipment is a Rapid Compression Machine, developed to support gaseous fuel research in the most effective way.

"Using this equipment, we can, in just a few hours, mix fuel gas according to customer specifications, test the combustion and give a "go – no go" answer to the gas in question," says Rintamäki. "This innovation is another significant competitive edge we have over our competitors."

SERVICE ORIENTATION

The emphasis of Wärtsilä's Fuel Laboratory Services will be more on the "services" aspect in the future, as the lab's mission moves away from R&D-orientated activities towards sales and helping to provide answers to customers with fuel-related questions.

"It remains to be seen to what extent we might grow in the coming years, but our biggest role within Wärtsilä is to contribute to the company's special expertise in general," says Rintamäki, who moved into the GM post in spring 2017. "It's a very exciting opportunity for me personally as well as for the company, but we are still at an early phase so we'll see how our role evolves. But we are fine-tuning our strategy to guide our focus on research in coming years."



Know thyself

Welcome to the 21st century, where machines have taken over our lives. It's a hectic place that is ruled by superhumans. What do you need to do to survive? We turned to bestselling author Yuval Noah Harari to get the answers.





"THE HUMANS WILL NOT BE ABLE TO SURVIVE AT ALL IF THEY ARE DISCONNECTED FROM THE NETWORK."

t started with research about medieval warfare. But when Yuval Noah Harari was appointed professor of history at the Hebrew University in Jerusalem, he took on a task that was not popular among his colleagues – teaching the introductory course about human activity on the planet. The course resulted in Harari's much-acclaimed bestseller Sapiens: A History of Humankind, a fascinating analysis of how Homo sapiens climbed its way to the very top of the food chain. The book has been translated into more than 40 languages.

Now Harari is back with another compelling book, *Homo Deus*, which depicts a future where *Homo sapiens* is replaced by a superhuman, *Homo deus*, who is tuned to perfection with the help of genetics, bioengineering and computing power.

If you particularly fancied science fiction books as a kid, you are in for a thrill. But it can also be a daunting read. Harari projects a future fraught with big questions, of which the question what to do when a robot takes your job seems to be the easy one. Still, there is an underlying positive note in the book, stemming from the human longing for kinship and connection.

TECH MERGER

In *Homo Deus* Harari predicts that "dataism" will supersede humanism. In a not-so-distant future, artificial intelligence will take over many of our cognitive tasks. This process is already well under way, says Harari, the way we merge with our smart phones and Facebook accounts. (And we are not just talking about our teenagers.)

"These are no longer dumb tools like a hammer or a knife. They are intelligent machines that constantly study us, adapt to our unique personality and actively shape our world view and our innermost desires," he says.

This development will pick up speed as machine learning, biometric sensors and direct brain-computer interfaces take the stage.

"In 2050 it is likely that your smartphone will not be separate from you at all," says Harari. "It will be embedded in your body via biometric sensors, and it will monitor your heart rate, your blood pressure and your brain activity 24/7."

The endless stream of biometric data from these sensors will



"EMOTIONAL INTELLIGENCE IS LIKE A MUSCLE: IF YOU DON'T USE IT, YOU LOSE IT."

make sure that your machines know our desires better than we do ourselves, and by 2100, Harari predicts that we will be completely merged with our machines.

"The humans will not be able to survive at all if they are disconnected from the network."

IMPORTANCE OF COMMUNITY

While we can use artificial intelligence to help us form the kinds of communities we truly gel with, there is a risk that our cognitive abilities to form those relationships can atrophy.

"After going on a date, I could just ask the AI to tell me exactly what the other person thought about me, and when hiring a new employee I could just leave it to the AI to evaluate the applicants."

But that might erode our emotional intelligence.

"Emotional intelligence is like a muscle: if you don't use it, you lose it."

So digitalisation, or dataism, will truly change our lives. Will there be any room for human interaction, and if so, what kind of interaction? The answer is yes, at least for a while.

"Humans are social animals, and that is not going to change any time soon," says Harari. Despite our many Facebook friends we are still dependent on belonging to an intimate community. That said, in the last 100 years or so we have seen our intimate communities slowly unravel.

"Unfortunately, they might break down completely in the coming century. Preserving such intimate communities should be a top human priority."

CONNECTING LOCALLY TO ACT GLOBALLY

In both books, *Sapiens* and *Homo Deus*, Harari paints a rather daunting future with huge risks. Still, both books can be read as calls for reflection, discussion and ultimately action to make the future take a different direction. Harari would like to see more discussion regarding how we can construct truly global identities and loyalties because, he argues, all our major problems are global in nature. He mentions global warming, global inequality and the rise of disruptive technologies such as artificial intelligence and bioengineering.

"In order to face these challenges successfully, we need global cooperation. No nation can regulate bioengineering single-handedly. And no nation can stop global warming by itself."

But while we need to cooperate on a global level, on the other hand we also need to protect our local communities because they are the mainstay of human well-being.

"Global communities can work only if they leave room for and give support to local communities."

The local communities will be more important as wealth will be distributed even more unequally. Harari talks about

the "useless class" that will never hold a job as a lot of the work tasks of today will be gone in 50 years.

"We don't have an economic model for such a situation. How to deal with the useless class may well be the greatest economic and political question of the 21st century."

DON'T LISTEN TO ADULTS

So with this future ahead of us, what should we teach our kids? Education no longer guarantees a good income, and thanks to robots and artificial intelligence a lot of professions and tasks we know today might completely vanish. What kids learn today at school might be irrelevant by the time they are at the height of their careers. That is why Harari says we should focus on teaching our kids personal resilience and emotional intelligence instead of focusing too much on getting them to acquire certain skills. Harari argues that traditionally life has been divided into two main parts: a period of learning followed by a period of working. By 2040, this model will become obsolete, and the only way we can stay in the game is to keep learning throughout our lives and reinventing ourselves continuously.

"If you try to hold on to some stable identity, some stable job, some stable world view, you will be left behind and the world will fly by you with a *woooosh*. So people will need to be extremely resilient and emotionally balanced to sail through this never-ending storm."

But teaching resilience and emotional intelligence is difficult. It is something you don't learn by dipping your nose in a book. So Harari's best advice to teens today is to not trust adults too much.

"In the past, it was a safe bet to trust adults, because they knew the world quite well, and the world changed slowly. But whatever the adults learned about economics, politics or relationships may be outdated."

He also urges today's teens to be careful with how they handle technology.

"You must make technology serve you instead of you serving it. If you are not careful, technology will start dictating your aims and enslaving you to its agenda."

Harari urges everyone – not just teens – to disconnect for at least a couple of hours every week. He himself logs off every day for a few hours to meditate, and goes to meditation retreats for a month or longer once a year.

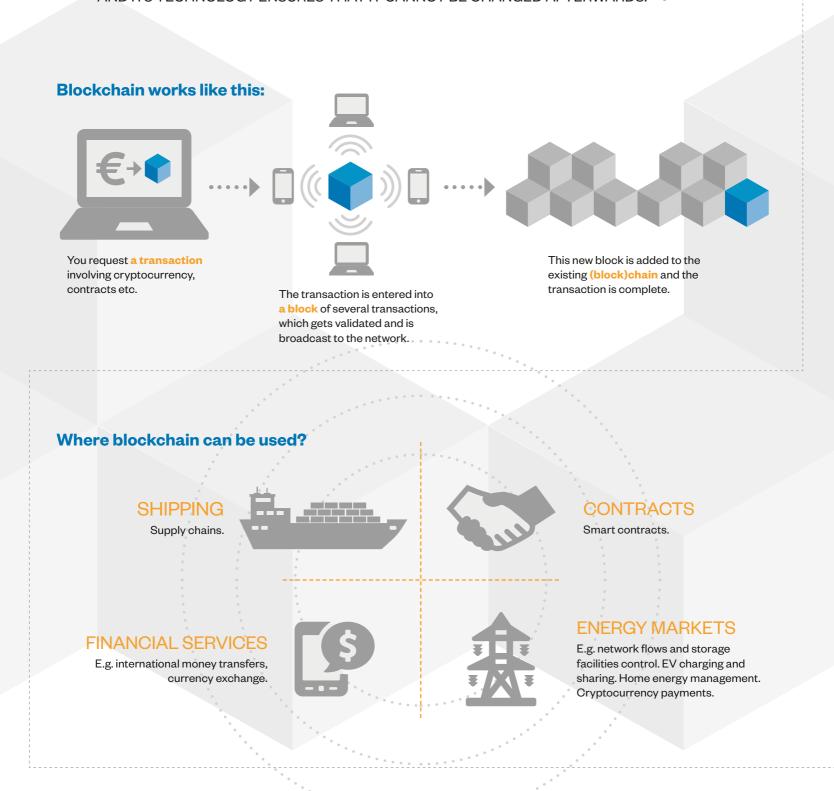
His final advice is the oldest one in the book: know thyself.

"Google, Facebook and Amazon are all relying on big data to get to know you better. So you have no choice but to really get to know yourself better because if you want to stay in the game, you have to run faster than Google. Good luck!"

infographics

BLOCKCHAIN IN A NUTSHELL

BLOCKCHAIN IS LIKE A DIGITAL, DISTRIBUTED LEDGER WHERE TRANSACTIONS ARE LINKED TO EACH OTHER. BLOCKCHAIN IS DISTRIBUTED ACROSS COMPUTERS AROUND THE WORLD, AND ITS TECHNOLOGY ENSURES THAT IT CANNOT BE CHANGED AFTERWARDS.



If you answer yes to these questions, blockchain might be a solution for you. A need for a shared database with multiple modifiers A need to maintain uniform content within the database The modifiers need to be able to make simultaneous modifications Somehow the modifications interact together The modifiers do not trust each other's modifications Using a trusted third party is undesirable for one reason or another Source: Mattila, J., Seppälä, T. & Holmaströn, J., (2016), Product-centric Information Management: A Case Study of a Shared Platform with Blockchain Technology, Industry Studies Conference Paper and Presentation, Minneapolis, USA An example of the use of blockchain in shipping: Trucking company takes the container to the harbour. All approvals are submitted electronically and blockchain is used to release the shipment. When a product is ready for shipment, its shipping information status is added to blockchain. The container is loaded to the ship, which takes it to the destination. The container arrives at the destination, clears customs and is loaded onto a truck, to be taken At the destination, the recipient to the destination. acknowledges receipt. This information is updated on the shipping information document on blockchain.

AMARINE MARKET

When speaking to Bill Burke from Carnival Corporation and Fraser Scott at Wärtsilä, they jokingly refer to themselves as "marriage counsellors." But the new strategic union between their two companies is not unlike most marriages – in that it benefits each partner while making an essential contribution to the common good.



solution



istorically, marriages often served as alliances between families to guarantee peace and mutual support. By creating such bonds, each gained strength from the support of the other, and by working together, they could reduce the sense of threat from others and thrive.

The "marriage" between Wärtsilä and Carnival Corporation is a performance-based agreement that responds to any concern with the safety, reliability or fuel consumption of the company's cruise ships covered by the agreement. It is an investment in an ongoing, mutually beneficial relationship. And, logically, just like a marriage between people, the union will take work.

Bill Burke, Chief Maritime Officer at Carnival Corporation, and **Fraser Scott**, Global Sales Development Director at Wärtsilä, explain to *Twentyfour7*. how the resulting benefits to each partner, as well as to Carnival Corporation's customers the world over, make the collaboration well worth the effort.

INITIATIVE FOR A MATRIMONIAL ALLIANCE

The deal structure is quite complex, but essentially Wärtsilä will look after engine maintenance and monitoring, scheduled or not. With Wärtsilä having that responsibility, Burke explains, "overhaul intervals can be safely extended, as Wärtsilä will be able to closely monitor ship engines. And we'll get better fuel efficiency with that as a focus."

"This is a completely different approach for Wärtsilä. We've looked for these relationships in the past, and we've done elements of this on a smaller scale. But because of its sheer size, this contract is significantly bigger than anything we've ever done," says Scott.

Though Burke was aware of this type of performance-based contract from his work as a Vice Admiral with the U.S. Navy, he doesn't know any of other agreements that are this comprehensive, and it will be the only one that either company has like this. But since Carnival Corporation is Wärtsilä's largest marine customer, and Wärtsilä is Carnival Corporation's biggest equipment supplier, this strategic partnership makes sense. Both companies came to the realisation that this was the right way to go and needed to make it happen.

The agreement provides incentives for both sides. "It should lead to a greater level of operational performance and excellence for both companies, which is the overall goal," Burke and Scott announced together.

"This predictability of cost for each partner is really useful," says Burke. Carnival Corporation will benefit from the predictability of having an expert overseeing maintenance, which will allow their staff to put more time and energy into the business side of things. For Wärtsilä,

the predictability makes it possible to put more effort into R&D, manufacturing and other functions to create products and solutions that are even better and more efficient.

"The cruise industry is continuing to grow. So, making operations safer and more efficient is good for business and the market," says Burke.

Through this joint management, both companies share financial risk based on outcomes, and remuneration is based on how the equipment performs. "If we do well, we get paid more," explains Scott, "and their pain is our pain, as we pay a penalty if the operational need is impacted."

THE TIE THAT BINDS

It's the engines' fuel consumption that is the key value driver for the business, and that decision-making process will be shifted to Wärtsilä. Scott notes that even the smallest improvements in fuel consumption add up to big savings: "For example, an improvement of 1% of a USD 1 billion fuel bill would represent a savings of USD 10 million."

But these small tweaks in fuel consumption are not possible without big data. Fortunately, with digitalisation, there is no shortage of that. From each of more than 500 Wärtsilä engines in Carnival's fleet, about 200 separate data points are captured every 30 seconds.

However, as Scott points out, "the data itself is useless without logarithmic analysis and specialist human interpretation. Wärtsilä's expertise makes it possible to detect negative trends in fuel consumption in real time and correct them."

Data also drives other efficiency improvements. Partnering with the original equipment manufacturer's (OEM) own technical specialists makes it easy to track how equipment is performing. "Highly skilled intelligence experts, who know all about our equipment, interpret the data, signals or triggers and make appropriate decisions for what do with a particular engine to help drive down overall cost," says Scott.

SMOOTHING OUT THE ROUGH PATCHES

Having Wärtsilä take care of the maintenance and logistics management drives organisational efficiency improvements as well. When Carnival managed these tasks for its different brands, there was some duplication of efforts worldwide, but for Wärtsilä, all these activities are part of a single organisation. Furthermore, rather than letting go the personnel from the previously duplicated structures, those people can be redeployed within Carnival to more value-added tasks.

When spare parts are needed, they can come from many places, but using OEM-specified and quality-controlled parts ensures highest reliability and performance. With Wärtsilä providing all the parts, the reliability and

quality are guaranteed, and, in this arrangement with Carnival, that is to Wärtsilä's advantage as well.

Another organisational efficiency improvement in this marriage is budgetary. Traditionally, Carnival's budgets for fuel and for maintenance were tracked independently. To keep the maintenance budget low, parts were used as long as possible to avoid the cost of replacing them. But that can come at the expense of fuel efficiency.

Through Wärtsilä's Dynamic Maintenance Planning, maintenance still can be postponed to get the full usable life from each component but not if performance starts to decline. For example, Scott explains, "With older fuel nozzles, there is eventually a degradation in fuel consumption. So, there is a point when replacing them is more cost-effective – as the savings in fuel more than outweighs the cost of new components."

With Wärtsilä making these kinds of decisions for the

greater good, it helps Carnival achieve an interplay of maximal safety, reliability and efficiency. That is what makes this true partnership shine.

MARITAL BLISS

Although sound finances are key, happiness is a more important marital metric. By teaming up with Wärtsilä to work on the same goals, Carnival can spend less money to operate and maintain a ship. That, in turn, helps Carnival reach its business goal – providing amazing cruise vacations – at a competitive price point. So, rather than tracking the nuts and bolts of maintenance, Carnival can focus its attention on keeping cruise passengers happy.

Fewer service interruptions also make for happier customers, and Wärtsilä's role in this partnership helps make that a reality, too. Burke explains, "If we buy an engine for a ship, Wärtsilä is more than happy to sell us parts and



services, but this deal gives Wärtsilä incentive to keep everything up and running at a high level. By minimising spare parts and services to increase uptime and fuel savings, both companies will ultimately benefit."

Of course, the occasional service interruption may be inevitable. However, with this plan in place, Scott points out, "We'll be able to address them rapidly and have a focus on fixing the problem rather than on determining who is at fault."

GROWING THE FAMILY

Carnival Corporation's business makes up about 50% of the cruise industry, which comes with a huge clientele volume. Of their fleet, 79 ships already have Wärtsilä engines. This is advantageous because, according to Burke, "It allows us to be more uniform in how we address our engines, as everyone will be doing it the same way. When people move from ship to ship, they are not surprised by how things are done. We can take the good ways of working, build on them and replicate them around the world."

So, the collaboration also opens doors - or, rather, ports - for assistance. "Our Carnival Corporation brands sail to nearly 750 ports around the world, and there are not many suppliers that could support our ships in so many locations," points out Burke.

Last but not least, the collaboration will generate a treasure trove of data that does not exist in the world today. Scott explains, "With all equipment fitted with condition monitoring and fuel performance monitoring that is transmitted ashore every 30 seconds, we have direct feedback on any actions taken. For example, change this component and see the improvement in fuel consumption."

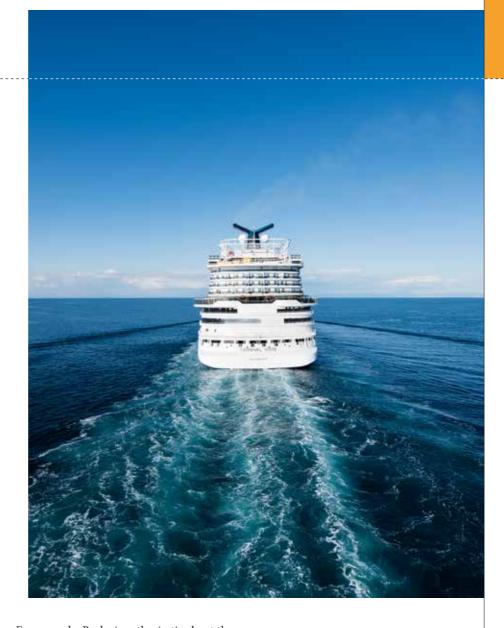
While Carnival Corporation will realise multiple benefits from the enhanced partnership, the real-time data also will provide Wärtsilä with insight that can be applied to work with other customers.

"The data-driven knowledge helps in this contract but in every other contract as well," notes Burke. Plus, Wärtsilä's R&D will be able to learn from the data to develop future concepts, which may further improve results such as fuel consumption, trial them live and see the results immediately.

DREAMS FOR THE FUTURE

From Burke's perspective, this agreement unlocks Wärtsilä's knowledge and experience for Carnival Corporation's benefit and lays the groundwork for future opportunities for the two companies to work together.

"It's a 12-year contract so that will keep us together for a long time, if all goes well," says Burke. "We might have to amend the contract, since there may be things we haven't thought of or sorted out in advance, and the collaboration may lead to some by-products or spin-offs of the main deal. Whatever happens, hopefully we'll both feel that this was the right thing to do, and we will figure out how to extend it. If we can make this contract work well, there will be many more opportunities."



For example, Burke is enthusiastic about the range of solutions and the level of product integration from Wärtsilä because Carnival Corporation wants to be very strategic about any modifications made to its ships. Burke explains, "There are many other products that would help us. In the future, we may even integrate training from Wärtsilä, for instance, if we consider converting to LNGfuelled engines."

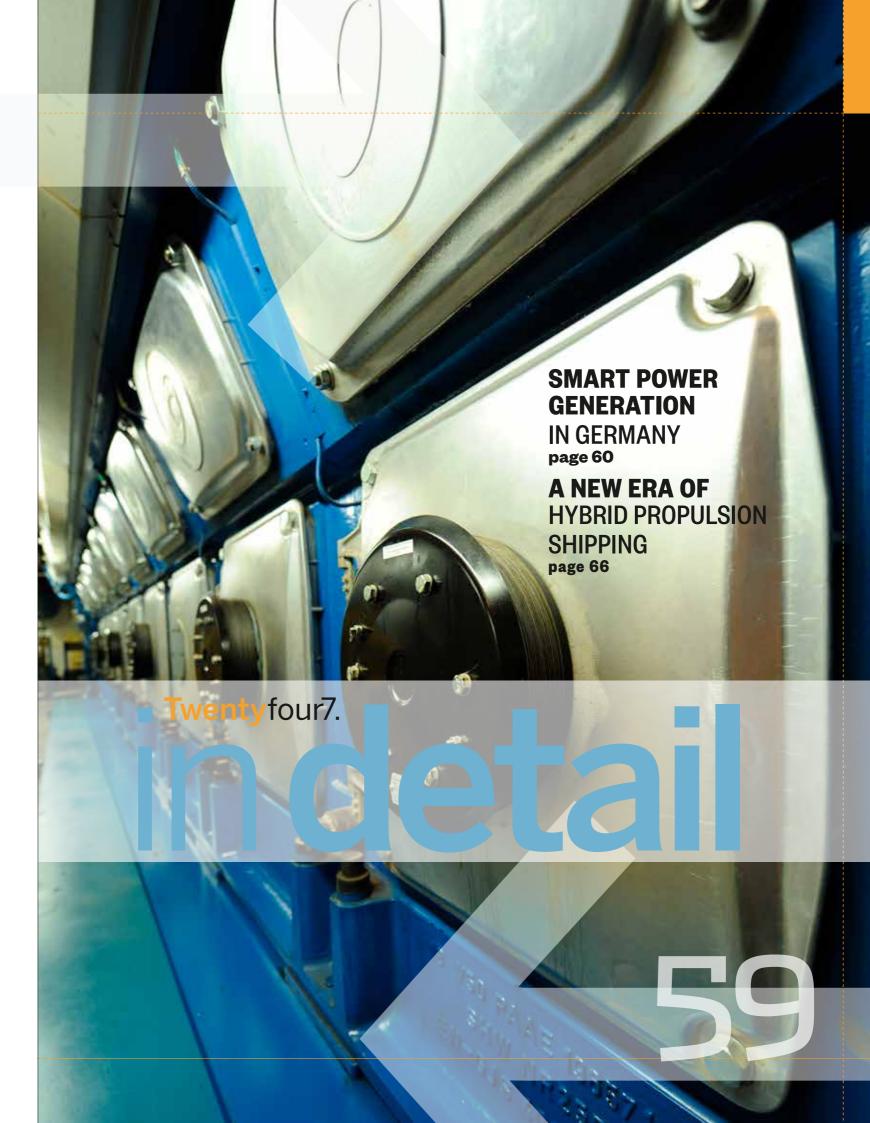
A MATCH MADE IN HEAVEN?

Both Burke and Scott point out that the process of devising this contract has been very intentional and strategic, which is especially necessary due to the size of the two companies. "As we get more people involved in it, we can see that change is taking place and what will be possible," says Burke.

Prioritising the relationship and communication is the key to making any marriage work. Issues do not just resolve themselves, and partners who make it must discuss their issues with the goal of creating a better future together. Each partner needs make the relationship at least as important as his or her own needs.

So now the two "marriage counsellors" are focusing on fostering good relations and communication at every level of both organisations to ensure this exceptional marriage thrives.

"WHEN PEOPLE MOVE FROM SHIP TO SHIP, THEY ARE NOT SURPRISED BY HOW THINGS ARE DONE. WE CAN TAKE THE GOOD WAYS OF WORKING AND REPLICATE THEM."



BRINGING SMART POWER GENERATION TO GERMANY

► TEXT: ISABELLE KLIGER ILLUSTRATION & PHOTO: WÄRTSILÄ

AS THE EUROPEAN POWER MARKET becomes increasingly volatile, Wärtsilä is supplying a large-scale combined heat and power (CHP) plant to Kraftwerke Mainz-Wiesbaden AG (KMW) in Germany. Find out how what this means to the German market.



"THIS IS A LANDMARK DEAL BECAUSE IT'S ONE OF THE FIRST MAJOR POWER PLANTS TO BE ORDERED IN GERMANY SINCE THE TURN OF THE CENTURY."

t is the objective of the European Union to transition to a low-carbon economy by 2050. To this end, it has committed to reducing emissions and increasing energy efficiency by 20% by 2020, with renewable energy set to play a key part.

Nowhere is this trend more visible than in Germany, which has Europe's highest penetration of wind and solar energy. Furthermore, the German government intends to increase the share of electricity produced by combined heat and power (CHP) plants to 25% by 2025. This is because CHP plants recover the heat generated from power production and deliver it to the district-heating grid, thereby ensuring multiple revenue streams.

Kraftwerke Mainz-Wiesbaden AG or KMW, in Germany, is one of the first utilities to take advantage of this new opportunity. Last year, it signed an agreement with Wärtsilä for a 100 MW CHP plant that will supply district heating to the city of Mainz and power to the grid of the region. The new plant, which will be fully operational by the end of 2018, is based on an agile, low-carbon system that will complement the use of green energy assets.

LANDMARK DEAL

"This is a landmark deal, in part because it's one of the first major power plants to be ordered in Germany since the turn of the century," says Frank Kettig, Business Development Manager, Wärtsilä Energy

Solutions, who was responsible for sealing the deal

Kettig says the new highly efficient plant, which consists of 10 Wärtsilä 34sG engines operating on natural gas, will be one of the first of its kind in Germany.

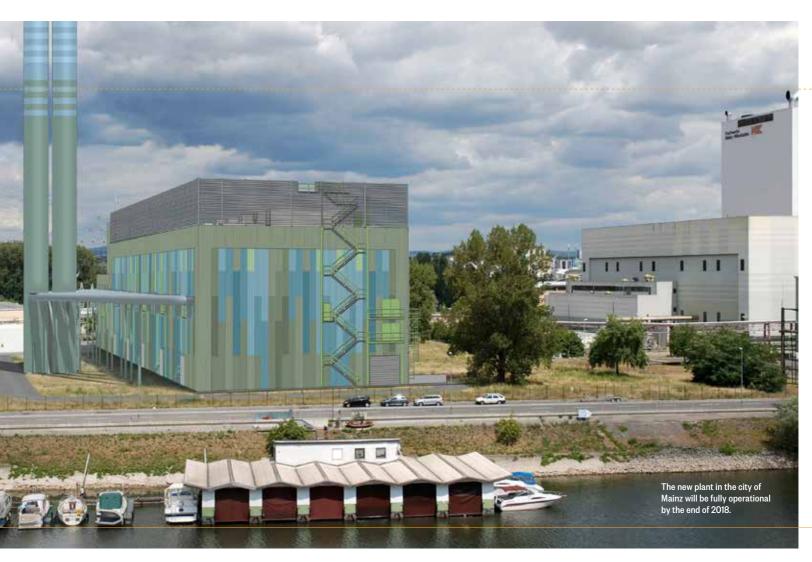
"It will also be the first German power plant that is engine-based instead of turbines, which is not a replacement but an add-on capacity."

Wärtsilä's engines can go from zero to full load in two to three minutes with close to no extra start costs. This explains why Wärtsilä's Smart Power Generation is the ideal solution for a system that needs to ramp up quickly.

Melle Kruisdijk, Vice President Europe, Wärtsilä Energy Solutions, explains that this creates a unique opportunity for utilities to take advantage of energy price fluctuations.

"When there's plenty of sun and wind, the cost of energy is very low. But when this energy supply suddenly drops off, the price peaks. The winners in this volatile market will be the flexible utilities who can respond the fastest," he says, adding that regulators in Germany have changed the rules governing the energy market to ensure that the price better reflects the real-time supply and demand.

In total, the plant will provide 100 MW of electrical power and up to 96 MW of heating power to the citizens of Mainz, where the district-heating network delivers heating to the equivalent of 40,000 households.



"We chose Wärtsilä to provide this solution because it has a proven technology and is already the leader in its field all around the world," says Dr. Lars Eigenmann, CEO at Kraftwerke Mainz-Wiesbaden AG. "Moreover, Wärtsilä really took the time to listen to our needs and help us find the best solution."

CAPTURING THE PRICE PEAKS

Dr. Eigenmann confirms that speed and flexibility are emerging as the key competitive differentiators on the European energy market.

"With more than 1,000 starts a year, we need to ensure that we have the best technology and a proven, reliable partner," he adds.

"With market prices fluctuating at intervals as short as 15 minutes, it's crucial for us to be extremely flexible and quick to start up in order to capture the peak prices. Only the engines built by Wärtsilä have the flexibility to start up in two to three minutes, making us very well prepared for the future," he continues.

"кмw is ahead of the competition," concludes Kruisdijk. "The current market will see more and more price peaks and Wärtsilä will deliver a plant that is able to ramp up at peak times, along with a comprehensive service and maintenance package tailored to кмw's requirements."



KMW signed an agreement with Wärtsilä for a 100 MW CHP plant.

GUARANTEED ASSET PERFORMANCE

Wärtsilä's scope in the agreement with KMW covers the engineering, procurement and construction (EPC) of the plant, as well as a 15-year service agreement for the maintenance of the power plant including performance guarantees.

Simon Widd, Support & Development Manager for Power Plant Agreements in Wärtsilä Services, explains that the guarantees enable the customer to ensure that the financial targets of its investment will be achieved for the entire duration of the 15-year contract.

"Customers need predictability, and with this agreement, KMW is able to determine how much it will cost to run the plant for the coming 15 years," says Widd.

Wärtsilä's Guaranteed Asset Performance is a solution that offers customers guaranteed operational reliability. Throughout the duration of the contract, Wärtsilä will, based on measured data, maintain the asset and ensure that the performance targets and guarantees are met.

BUILDING THE PERFECT **HYBRID**

► TEXT: SAMI ANTEROINEN ILLUSTRATION: WÄRTSILÄ

COMBINING INTERNAL COMBUSTION

ENGINES and energy storage is a winning formula for Wärtsilä.

■ he future of energy is hybrid. Case in point: fast-starting internal combustion engines - integrated with an energy storage - offer considerable potential for fuel and cost savings. Especially in remote areas, such as islands and isolated grids where fuel prices are generally high, these types of integrated hybrid power plants hold great promise.

Hans-Alexander Öst, Project Manager, Energy Solutions at Wärtsilä, explains that traditionally, in isolated grids, there is a need to operate power plants on partial load for spinning reserve purposes.

"However, the integration of energy storage into an internal combustion engine power plant will nearly eliminate this need. By using the energy storage capacity as spinning reserve, the thermal generation can be operated on higher load with better fuel efficiency and with less engines running," says Öst.

RESERVE POWER

In case of disturbances in the network - or even within the power plant – the energy storage has the potential to power the system until a stand-by unit is ready to take the required load from the energy storage. In cases involving solar PV generation, the "internal combustion engine + energy storage" hybrid

solution can conceivably provide an energy reserve, for example, during cloudy periods.

"An additional benefit with a multi-unit installation of fast-starting engines is that the size of the energy storage solution can be optimised," says Öst, who has 10 years of experience in delivering enginebased power plant projects to Wärtsilä's customers.

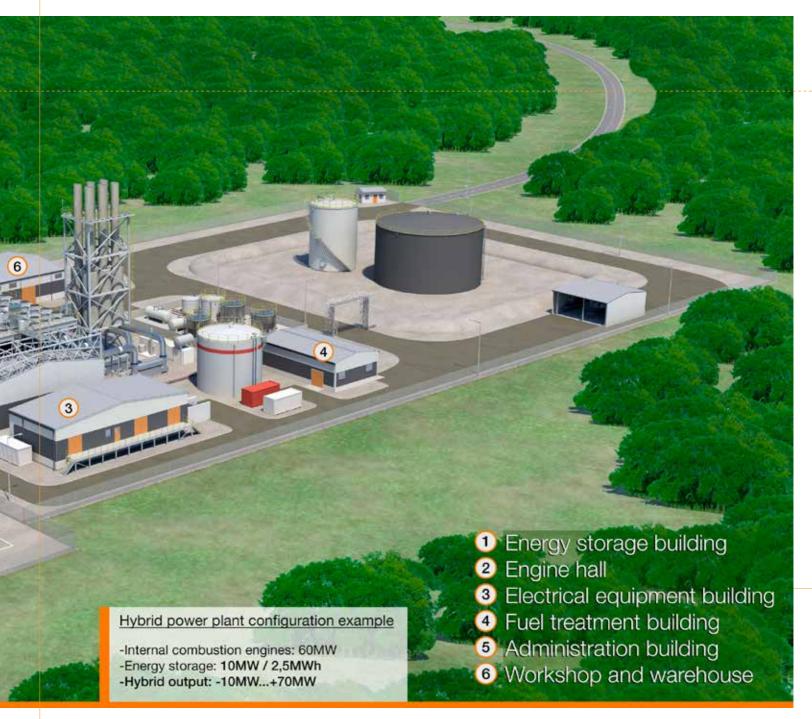
The upside of hybrid power plants, he says, is truly exciting, since they can help Wärtsilä enhance performance, reduce fuel consumption and reduce maintenance costs via integration.

"The short payback time and the annual savings achieved by combining these two assets makes it an exciting new way of optimising the power plant. This way, we can reduce customers' operating costs.

"Additionally, by optimising the engine power plant and the energy storage to function as a superior hybrid

"ACCORDING TO OUR CASE STUDIES, ANNUAL FUEL SAVINGS OF 6% COULD BE REACHED JUST BY ADDING **ENERGY STORAGE.**"





power plant, Wärtsilä can further improve the flexibility and the performance of the hybrid plant, thus providing additional value for the customer," he explains.

GREEN AND LEAN

During the past decade, the demand for "greener" electricity production has been constantly on the rise. Öst says this is normally achieved by adding renewable generation to the system – but that's not the only way. Greener electricity can be achieved also by adding energy storage to thermal power plants.

"According to our case studies, annual fuel savings of 6% could be reached just by adding energy storage, thus also reducing the emissions of the power plant."

Öst points out that there is currently a "clear case" for the integration of renewable generation to thermal generating systems and for further optimising

and integrating all assets with energy management systems. With the available energy storage technologies and their decreasing prices, there is little doubt that hybrid power plants with energy storage will be a force to reckon with.

"Li-Ion battery prices have come down quite a lot in recent years, mostly thanks to the car industry, which has driven the development of the batteries forward for their electric and hybrid cars."

The hybrid concept is fairly a new one and the markets are just starting to recognise the potential in properly combining thermal units with energy storage. Nevertheless, as renewable generation keeps entering new markets, the energy sector creates even bigger demand for flexible, fast, reliable and affordable electricity generation. That spells huge potential for Wärtsilä's winning formula.

DEME-D FIT FOR DREDGING UP THE FUTURE

► TEXT: ALEXANDER FARNSWORTH ILLUSTRATION: WÄRTSILÄ

BELGIAN COMPANY DEME and Wärsilä joined forces to build, at 40 MW, the world's most powerful LNG-fuelled dredger

t could be argued that the dredging industry is immune to slowdowns. Historically, the world's population and growth has concentrated on coastal areas and this will likely continue, requiring ever more dredging, land reclamation, dyke and port construction in the future.

"More than 60 percent of the world's population lives less than 100 kilometres from open water. Thirteen of the world's 19 megacities are in coastal zones. Water is a threat and an opportunity to mankind," says Jan Gabriel, head of newbuilding and conversion at DEME, the Belgian dredging powerhouse, a Wärtsilä customer for longer than most remember.

"Population is predicted to grow to 8–10 billion by 2050. This creates enormous challenges for transporting people and goods in a safe, economic and environmentally acceptable way. Waterborne transport is slated to grow explosively; overpopulation, industrial development and the need for environmental protection will place new pressures and demands on the world's infrastructure."

TOP FOUR

DEME's "forefathers," Ackermans & Van Haaren, the Societé Générale de Dragage and Baggerwerken De Cloedt have a history of worldwide dredging excellence going back almost 150 years. Today, DEME is one of the biggest and most prominent dredging companies offering one-stop, multi-disciplinary, turnkey solutions and services to the offshore, wind farm, and

port-building industries.

DEME just placed orders for two new LNG-propelled ships, Orion and Spartacus, which will use Wärtsilä engines and propulsion machinery.

Besides offering engineering solutions for many other DEME vessels like hopper dredgers, cable layers and offshore construction vessels over the years, the Orion and Spartacus projects signal a much closer partnership than was originally thought possible all to benefit efficiencies, the environment and the bottom line.

"The decision to utilise clean LNG fuel represents our commitment to provide environmentally sustainable solutions for our operations. Wärtsilä has extensive experience and vast technological knowhow in this field, which is why we have selected them as our partner," says Gabriel.

POWERFUL STATS

The 210 metre-long Orion will be powered by four 9-cylinder Wärtsilä 46DF dual-fuel electric propulsion engines, and two 6-cylinder Wärtsilä 20DF dualfuel engines. Wärtsilä will also supply two custom made retractable thrusters, four underwater demountable thrusters, the Wärtsilä LNGРастм storage and supply system, as well as commissioning, site supervision and extended project management services. The Wärtsilä equipment is scheduled for delivery to the Cosco shipyard in late 2017.

The 164 metre-long Spartacus will have a total



"GROWING POPULATION **CREATES ENORMOUS** CHALLENGES FOR TRANSPORTING PEOPLE AND GOODS IN A SAFE, ECONOMIC AND **ENVIRONMENTALLY** ACCEPTABLE WAY."



installed power of 44,180 kW. It will feature four 9-cylinder Wärtsilä 46DF dual-fuel engines, two 8-cylinder Wärtsilä 20DF dual-fuel engines, and a Wärtsilä LNGPac fuel gas storage and supply system with a newly designed bilobe tank arrangement. Wärtsilä will also supply two fixed pitch propellers with shaft assemblies and HP nozzles, and two tunnel thrusters, as well as commissioning, site supervision, and extended project management services. The Wärtsilä equipment is scheduled for delivery to the Royal IHC yard in the Netherlands in late 2017.

"We are pleased to have been involved from the conceptual design stage, since this enables our input on providing the most fuel efficient solution. We are delighted that the Wärtsilä 46DF engine has been

selected, as the dual-fuel version of this well-proven and popular engine has only recently been introduced," says **Arthur Boogaard**, General Manager, Business Development Special Vessels Wärtsilä.

EARLY PROCUREMENT

According to both parties, the key to this successful partnership was to start the procurement process early on between DEME and Wärtsilä.

"Conventional shipbuilding gives shipyards free hands to select equipment vendors for the eventual handover to owners. In this case however, DEME and Wärtsilä worked closely during the project's planning stage, to 'de-risk' and optimise the entire process to secure early performance before a shipyard was

even selected. This procurement thinking reduces lead times, which in turn means the ship can go to market earlier and generate revenue quicker. It was very transparent," says Boogaard.

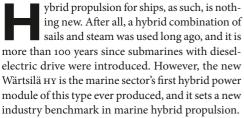
Henrik Wilhems, Director Sales Support, Wärtsilä Marine Solutions, puts it into context:

"In dredging, there is no overcapacity or oversupply as in other shipping segments. And there are multi-million dollar projects, some worth billions, popping up all over the world - Shanghai port, Suez Canal, palm islands in Dubai, wind farms in the North Sea, and other projects across the developing world - so there is still a lot of dredging work to be done," says Wilhelms.

A NEW ERA OF **HYBRID PROPULSION SHIPPING**

TEXT & ILLUSTRATION: WÄRTSILÄ

IT WAS BIG NEWS for the automotive industry when hybrid cars became production models rather than a hypothetical concept. The marine industry is now moving in the same direction, thanks to Wärtsilä's groundbreaking new hybrid power module for ship propulsion.



It would be, one can assume, only a matter of time before ships progressed into the world of hybrid propulsion running on a combination of conventional engines and energy storage systems. But the task has not been easy for various reasons, and the set of aims is rather broad. For example, not only does hybrid ship propulsion improve fuel efficiency and reduce exhaust emissions, it also needs to attain efficient power management, flexible layout solutions, and reduced noise and vibration. The Wärtsilä ну has been developed to meet all these needs.

The need to lower fuel costs and reduce emissions is common to owners and operators around the world. But compliance with strict environmental legislation is a becoming a global requirement. By being able to switch from a conventional enginebased energy source to electrical storage power when sailing in harbours or close to population centres, for instance, legislative restrictions can be overcome

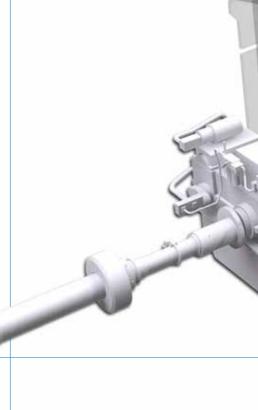
and fuel can be saved. It is widely expected that hybrid propulsion solutions will represent a significant percentage of all contracted ships within the next 10 years.

UNPRECEDENTED INNOVATION

The introduction of the Wärtsilä HY marks the beginning of a new era in marine propulsion, and an important step along the road towards optimal operational efficiency. Development of the groundbreaking Wärtsilä HY has been made possible by the company's unique position as a total solutions provider. With extensive and unmatched in-house capabilities in developing and controlling both the engine technology and electrical and automation (E&A) systems, the company has been able to combine these competences to create a deeper level of product control.

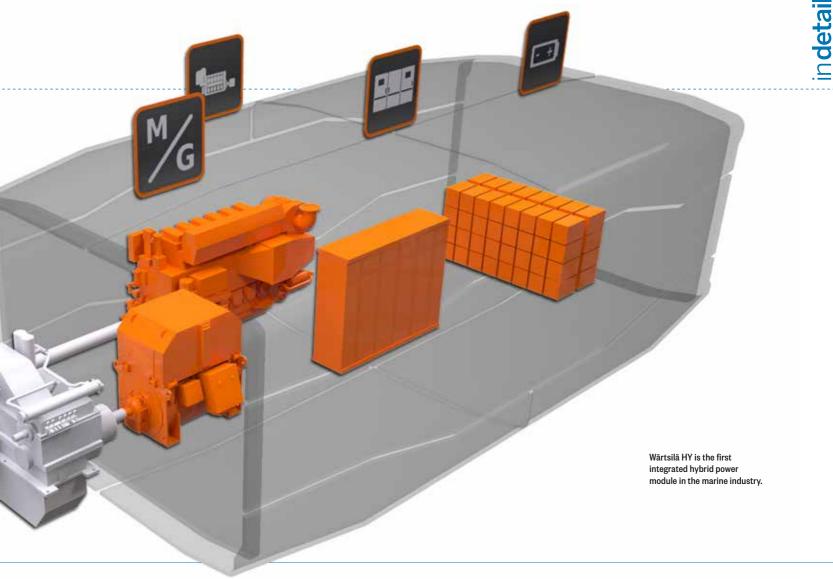
The result is an unprecedented innovation leap in this field. The hybrid power module produced combines engines, an energy storage system and power electronics through a new, highly sophisticated and fully integrated energy management system (EMS).

This latest generation, specifically designed EMS, works as the overall "brain" for the Wärtsilä ну product. It not only controls the energy flows between the different power sources, but also adds performance optimisation features with respect to emissions, trim



"THIS DEVELOPMENT OPENS THE DOOR TO A NEW ERA OF MARINE TECHNOLOGY THAT **WOULD HAVE BEEN** UNIMAGINABLE UNTIL VERY RECENTLY."



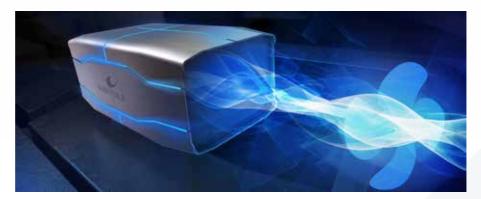


and route, and the monitoring of long-term vessel performance. Furthermore, it creates an entirely new level of interaction with the ship's onboard systems, thereby providing enhanced operability and greater predictability.

Giulio Tirelli, who is Director of Marine Engineering at Wärtsilä Marine Solutions, is emphatic about the impact on the industry that the Wärtsilä ну will have. "This development opens the door to a new era of marine technology that would have been unimaginable until very recenty," he says. "It is made possible by Wärtsilä's unmatched product portfolio and extremely broad range of in-house expertise which together, give us the possibility to combine technologies from quite different fields. This in turn strengthens our leadership position in frontend innovation, which provides unrivalled benefits to our customers and partners."

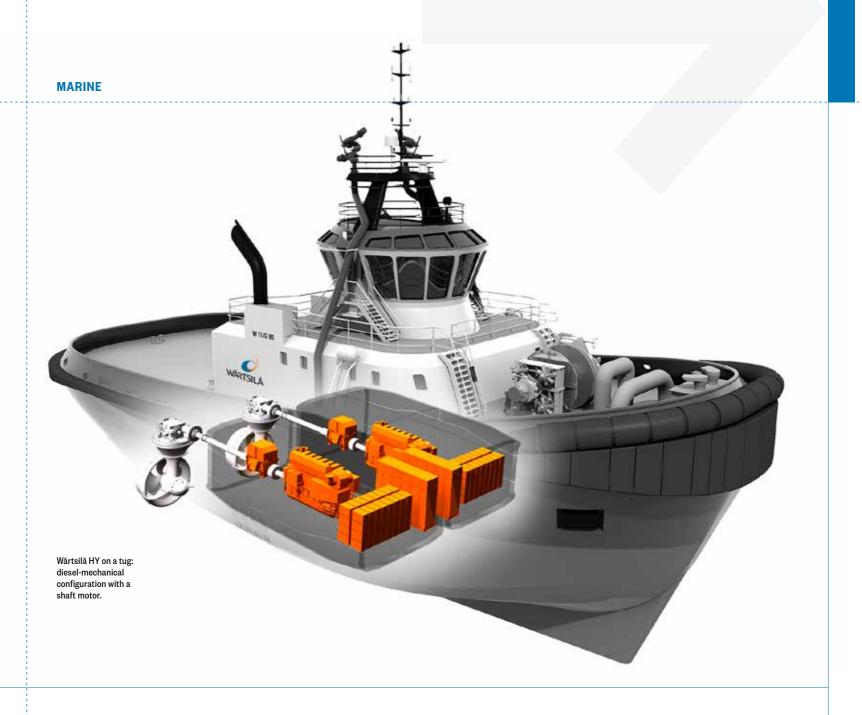
GUARANTEED PERFORMANCE

By utilising a propulsion system with multiple operating modes, the system's response to differing conditions can be optimised, while the vessel's



fuel efficiency and overall performance are notably enhanced. The glaring difference between the Wärtsilä HY and other hybrid systems is that performance enhancement can be guaranteed with the former. At the same time, a higher level of redundancy compared with conventional solutions promotes increased safety. Wärtsilä's advanced logic control technology enables better fuel consumption performance than with conventional systems, even when the load varies. Importantly, there is instantaneous load acceptance with rapid response to step-

The list of customer benefits provided by this



latest Wärtsilä innovation is indeed long. Central to all of these advantages is the increase in operational efficiency, which in turn has a direct beneficial effect on fuel consumption and exhaust emissions. In fact, in "green" mode there are zero emissions, while in all modes – from start-up to full power output – the operation is smokeless, thanks to a new Wärtsilä patent pending procedure. Additionally, the reduced engine operating time lowers the maintenance requirements while also extending the intervals between overhauls. The Wärtsilä HY also comes with entire system certification.

SOLUTIONS DEDICATED TO SPECIFIC TYPES OF VESSELS

Clearly, the exact needs and operating criteria of vessels vary tremendously, depending upon the type and the sector being served. For example, one could hardly expect that the requirements for harbour tugs are the same as those for a cruise ship. Thus, a single solution that suits all vessels probably means that it

is not entirely suitable for any particular type of ship.

For this reason, the Wärtsilä HY will have dedicated versions specifically designed for each category of vessels. The first versions being made available will be adapted to suit the exact needs of tugs, medium-sized ferries, and medium-sized cruise ships. It represents the first new product launch for this type of product where each individual version is dedicated to a specific market. Wärtsilä will follow these initial introductions with dedicated versions of the Wärtsilä HY for other vessel segments in due course. This approach is quite unlike the typical product introduction, where the aim is to reach as many markets as possible with a single unit.

As Tirelli points out: "Stay tuned. Additional versions are coming, and with this new product we are moving the shipping industry from being on the brink of hybrid propulsion to a position where it is truly viable. The Wärtsilä HY will, I believe, prove to be the catalyst for establishing a new way of thinking in the industry."

"WE ARE MOVING THE SHIPPING INDUSTRY FROM BEING ON THE BRINK OF HYBRID PROPULSION TO A POSITION WHERE IT IS TRULY VIABLE."

TEXT: LOTTA HEIKKERI PHOTO: BENJAMIN SUOMELA

On a musical note...

For world-renowned conductor and composer **Esa-Pekka Salonen**, classical music is all about exploration and discovery. It is about interpreting what has been said between the lines of the notation.

Earlier this autumn, in order to celebrate Finland's one hundredth anniversary, Salonen conducted an orchestra comprising students from two schools – his alma mater Sibelius Academy in Helsinki and the Juilliard School of Music in New York.

Working with young musicians gives en-

ergy to the seasoned conductor, who is currently the Principal Conductor and Artistic Advisor for London's Philharmonia Orchestra.

"There's freshness when they play music that I've conducted hundreds, if not thousands of times," Salonen says. "Suddenly things sound new to me again. And that's the best thing that can happen."

Wärtsilä is the sponsor of the tour. Find the full interview, videos and podcast on wartsila.com/twentyfour7

*Sign off

AT YOUR SERVICE | CLASSIC | AMBITION | LITTLE ENGINEER | COLUMN

The human touch

DIGITALISATION IS DICTATING all narratives these days, but will it make human contact redundant in the future? We posed this question to Annika Parkkonen, the new Vice President, Human Resources, at Wärtsilä Marine Solutions. Her answer will calm your nerves. At least for now.

TO WHAT EXTENT WILL DIGITALISATION **CHANGE THE WAY PEOPLE WORK?** It will transform the way we lead and how teams are organised. There is a lot of work that can be automated, and it will, because it's more

efficient. What cannot be digitised will have more value, which means that the creative, insightful things people do will be more valuable than ever.

WHAT WILL HAPPEN TO CUSTOMER **CONTACT IN THE DIGITAL AGE?**

If there's one thing that won't be digitised on a similar scale, it is customer contact or communication with the customer. We can automate background processes, but selling requires human contact. You can chat with a bot in a web shop, but when you pick up the phone to

> **"COMPANIES WITH** REAL PEOPLE WILL STAND OUT FROM THE CROWD."

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ask a question, you don't want to talk to a robot. you want to talk to a person. And this is crucial for us in being customer-centric, which means we truly understand the customer's needs and make products and services that suit them. We sit on the same side of the table and collaborate constantly with our customers. I believe, in the long run, companies with real people will stand out from the crowd.

YOU ARE AN ADVOCATE OF CREATIVITY. WHAT IS THE ROLE OF CREATIVITY IN INDUSTRIAL BUSINESS?

All work is creative: you see a problem and you find ways to fix it. Creativity is in all of us - it's just a question of how we use it and how much we're willing to work for it. Also, the skills required in the future will be creative - being able to understand the bigger picture, complex problem solving and communicating. This is because data, as such, isn't valuable, but what we make of the insights from the data, is. That cannot be automated.



CULTURE WATCH]

sign off



ORIGIN

Decades before the likes of Oculus Rift and Google Daydream captivated our virtual headspace, the relatively humble View-Master provided a full-colour, 3D escape. This new take on the 1850s stereoscope was born in Portland, Oregon, in 1938 when postcard producer Sawyer's teamed up with organ maker William Gruber to create what would grow into a global phenomenon as well as an entertainment icon of the 20th Century. And all this without the benefit of Wi-Fi.

TECHS & SPECS

Developers

William Gruber and Sawyer's, Inc.

Material

Kodak Tenite, Bakelite (from 1944), lighter plastics (from 1962)

Original film Kodachrome

[SCIENCE]



If visiting a 21st-century dentist makes you nervous, imagine what your loe Age ancestors had to endure. A pair of

13,000-year-old front teeth recovered from a site in Tuscany, Italy, contain what researchers have determined to be the earliest known use of dental fillings. The teeth show evidence of being drilled by tiny stone tools and filled with bitumen, plant fibers and hair. No word yet on how paleolithic dentists got their patients to sit still.

[LITERATURE]



Remember the notion that the internet would be the world's great leveler, a free platform for countering government and corporate power? In his new book, *Move Fast*

and Break Things, American academic **Jonathan Taplin** looks at how that trend has been knocked off course by the likes of Facebook, Google and Amazon, monopolies, he argues, that have cornered the market on culture and developed into an overly influential bloc similar to Big Oil and Big Pharma.

[TECHNOLOGY]



In a development that would no doubt have made **Douglas Adams** chuckle, scientists are predicting that AI will be able to interpret dolphin chatter

by the year 2021. Swedish-based startup Gavagai AB and the KTH Royal Institute of Technology have teamed up in a four-year project to collect as much dolphin language data as possible for their decoding efforts. As the mammals' patterns of clicks and whistles aren't too dissimilar to human speech, experts say, they should theoretically be able to establish interspecies communication.

[AMBITION]

The 500-billion-dollar guestion

Did you know the Rosenfeld unit, which equals saving three billion kilowatt-hours, was named after the godfather of energy efficiency, Arthur Rosenfeld? We tell you his story.

here are some things that never change in California - the satin sheen of Hollywood, the sun-bleached tousle of young surfers, the interpretation of tremors along the fault lines. Though these are known dreams and dangers, there's something few people know about this state: per-capita, electricity usage has barely changed since the mid-1970s.

Not all of us even remember that far back. In 1975, Barry Manilow's single "Mandy" went gold. Elvis was still alive. Björn Borg dominated tennis. And it was the year of the oil crisis in the us when people had to queue to buy petrol (or stand in line, as the Americans themselves would say, to get gas).

One of those people was **Arthur Rosenfeld**, an experimental physicist, who would soon set aside his study of subatomic particles to help design energy-efficiency standards and technologies. And a man who can take credit for the stalled per-capita consumption of energy, while the rest of the us has nearly doubled its per-capita electricity consumption since.

GENESIS OF EFFICIENCY STANDARDS

It was during the oil crisis, when about to go home via the gaspump line, that Rosenfeld turned off his office lights and wondered how much energy they could save if everyone had an austerity-minded attitude towards electricity use. The Washington Post writes that Rosenfeld went on to take a simple tour of his office, tallying lights and appliances, and realised his office alone could save the equivalent of 100 gallons of petrol per weekend.

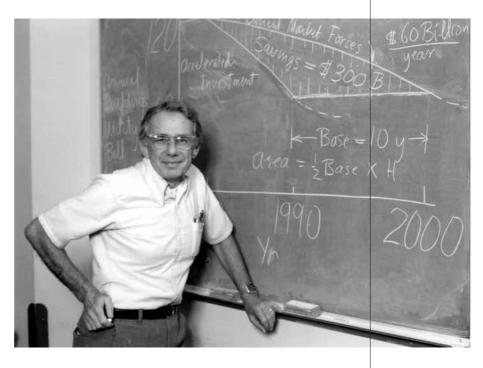
A few years later, Rosenfeld had a meeting with the state governor, and the first steps were taken towards energy-efficiency regulation on refrigerators. Anyone who has a modest and notso-updated country cabin will recognise the type – that kind of heavy, unyielding box looming large in the kitchen, consuming so much electricity that it emits a grizzly-like growl and a dolorous clank when it kicks up a notch on sweaty afternoons. After Rosenfeld's meeting with the governor, such fridges could no longer be sold.

New fridges also had to be designed to the new standards, which had national ramifications, as Rosenfeld's former student and long-time colleague Professor Ashok Gadgil explains. "It didn't make sense to have two production lines. Manufacturers said, 'Damn it, it's not worth it. We'll just make one production line.' So, California led the way and caused refrigerators for the entire country to be made to California standards," Gadgil tells Twentyfour7.

TOWARDS THE COMMON GOOD

Apart from new technology, the cooperation with legislators for what people call the common good was new - and not without controversy in free-market America, argues Gadgil. Research showed that the shelf price of a household appliance meant more to the buyer than how much they'd pay for the electricity to run it. So legislators had to go in to make a change. "Rather than just wringing his hands and thinking it's terrible that consumers only think short-term, Rosenfeld thought about how society could solve this problem. Then he worked with legislators to do something that markets alone can't do because of individual behaviour," he says. "That was a bit counter to the free-market tendency of American economists then, and it is still against that tendency."

The idea was never to antagonise manufacturers, which legislators kept in mind when phasing in new regulations. "The



rules were announced three years in advance so producers had enough time to thicken their insulation so there was not a catastrophic emergency," Gadgil says, but adds that manufacturers did take the matter to court. The key then was for the scientists to stand their ground with cool heads and account for the calculations and data. "The methodology is transparent. It was legally challenged by the Association of Manufacturers, and it had to be fought and proven to the judges that these regulations were indeed substantially in favour of societal interest," Gadgil says. "This had to be rigorously done and was not just an idea."

IT'S ALL ABOUT THE SAVINGS

Fridges were just the beginning, and many more steps followed. A team of researchers at Berkeley's Center for Building Science, led by Arthur Rosenfeld, helped develop electronic ballasts, which would make the compact fluorescent lamp possible and popular. They developed a coating for windows to trap heat in the winter and keep it out in the summer, and insulated homes further with a reflective roof design that aids with cooling.

And, long before data was the hottest name on the block, they developed computer programs to analyse how much energy buildings used. A year after the fridge rules came into effect, the state governor also updated the building codes in an attempt to cut energy waste. And these rules were successively tightened on a cycle of about every three years.

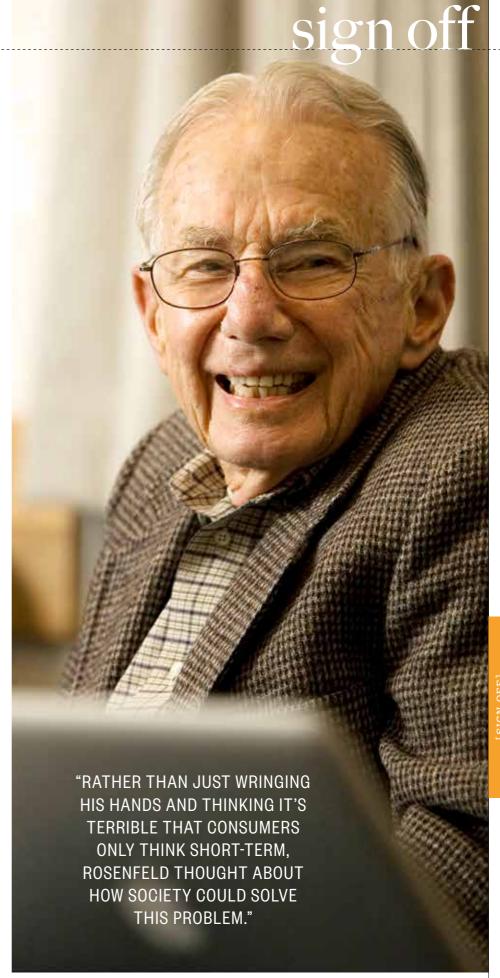
Such were his efforts and achievements that Rosenfeld would become synonymous with energy efficiency, and his name was given to a new unit, the Rosenfeld - a savings of 3 billion kilowatt-hours per year. To put that in proportion, it's the same electrical energy that a 500-megawatt coal-fired power plant can generate in a year.

PARAGON OF OPEN-MINDED CURIOSITY

Yet, he remained a modest man, says Gadgil, who remembers Rosenfeld fondly. "He was wonderfully generous without a big ego, which is unusual among professors, particularly for someone who saved the United States 500 billion dollars just on appliance standards. His future savings to the us economy will be another half a trillion dollars," Gadgil points out.

Rosenfeld kept active on campus - and as a Lawrence Berkeley National Laboratory Distinguished Scientist Emeritus often dropping in on seminars. "He'd love to sit in the front row and ask tough questions. But the seminars were usually in the afternoon, and if Rosenfeld started dozing in a seminar, it was a good sign. It meant that he was sure that the work was good quality, and he could doze. If he wasn't dozing, that meant he was likely irritated and sharp and would be soon asking tough questions," Gadgil recalls. "Most people think that, if the listener is dozing, he is bored, and it's not a good seminar. With Rosenfeld, it was the opposite."

At the time of his death in early 2017, Rosenfeld had grown frail but had lost none of his wit. Gadgil says of his friend that a childhood spent abroad made him open-minded and curious, and success hadn't dampened either characteristic or his generosity. "Despite those successes, he had an easy smile and was very approachable. Maybe because of his childhood experiences abroad, he always was very open and friendly to people from other countries."



TEXT: STEVE ROMAN

[TRAVELLERS' GEAR]



Out-geek all your colleagues at your next company retreat with the **AirSelfie**, a pocket-sized drone that can snap aerial selfies of your group from up to 20 metres away. The 61-gram device features a five-megapixel video cam, self-generated Wi-Fi and a three-minute flying time.



You'll never have to drag your bag again with the **Travelmate**, a fully autonomous robotic suitcase that connects to your smartphone to stalk, um, follow you. It uses turn signals and navigates through crowds with the help of adaptive AI. Available in three sizes, including a carry-on version.

Tired of sporting that just-unpacked look? The **Steamfast SF-171**, touted as the world's smallest steam iron, is about the size of a computer mouse and weighs just over 400 grams. The tiny dual-voltage wonder packs a full 420 watts of wrinkle-busting power.





GETTING KIDS TO PLAY VIDEO GAMES is never a challenge. It's getting kids to stop long enough to do their homework that can throw parents into a barrel-throwing, Donkey Kong-style rage. But what if the seductive power of the game-verse could be channeled into a brain-boosting activity of the creative kind?

St. Louis-based tech company Pixel Press recognised this potential and came up with Bloxels, a system that encourages kids to develop their design and logic skills by generating their own video games – monsters, jet packs and all.

Nominated for 2017's "Game of the Year" by the U.S. Toy Industry Association, the easy-touse game starts with players arranging coloured blocks on a 13x13-piece game board, then snapping a photo to import the design into a gaming app for further editing and play. In the level-creating step, each of the eight colours represents a different feature, be it land, water, a hazard, a coin or a power-up like a bomb or extra health. Heroes and villains can be designed and animated in a similar way, with a wider choice of colour and texture available in-app.

Once kids get the swing of the game, they can share their levels with other players on the Bloxels Infinity Wall, buying and selling their creations with the game coins.

Bloxels can be used by kids as young as 5 but is usually recommended for the 8-14 age group. The game requires hands-on help from an adult, which is guaranteed to be a much more engaging form of parent-child teamwork than any player-1, player-2 set-up.



Digitalisationthe new normal

A FEW YEARS AGO, I asked my Korean friends to teach me how to cook Korean food. They invited me to their home since they had a rice cooker and other necessary ingredients and equipment, but I said no. I insisted they come to my place instead. I wanted to learn to cook Korean food with the modest supplies I had, and not just rely on their appliances.

The same goes for digitalisation. It is not about the tools, it is about the way we work and organise ourselves. Going digital does not translate to a change in the IT set-up. It is a new way of doing business where customer centricity, agility, innovation and use of data meet modern technology.

I have spent the past 17 years working with digital transformation, mainly in online banking and the mobile phone industry. In the business-to-consumer (B2C) sector, the digital transformation is already on, and the pressure to renew is very strong. Even though the pace of change may not be as rapid in our industrial sector, there is a lot we can learn from B2C.

The first takeaway is about the spirit. If you don't reinvent yourself, you are gone. The second thing we can learn is the speed of change. It pays off to be alert and accelerate, even though the business isn't as tumultuous as it is in some sectors. It also pays off to benchmark the services that function the best. Why shouldn't we bring the same level of user friendliness into business-to-business (B2B) sector as well?

These are the things we are now looking at with Wärtsilä's Digital Transformation team. Even though we are focusing on digitalisation within the company, the benefits will be reaped by the customers. Co-creation and co-innovation will be a standard process, and the new ways of working will show in everything we do, from sales to manufacturing.

Digitalisation is not just a short phase or a fad. It will be the new normal – it has been the new normal for a while, actually, and there is no turning back. We are co-creating the future.

Selina Heiska

Vice President, Digital Transformation