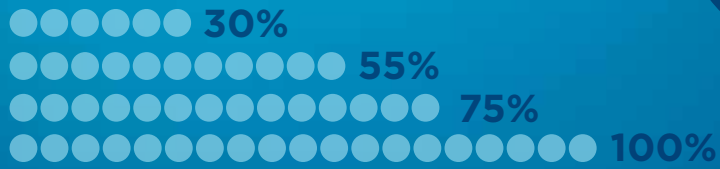




# DESMI



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# THE NEW TREN CO



# A GOLDMINE OF KNOWLEDGE TO SHARE



In recent years, many articles have been written at DESMI in order to share our knowledge with colleagues, customers, business partners, and media around the world.

It is no surprise that after more than +180 years of business, we possess wide knowledge of pumps, pumping and oil spill response solutions. Knowledge that sometimes remains inside the minds of our colleagues and doesn't get shared.

At DESMI, our knowledge is no secret. We want to share our many years of experience, we want to pass on knowledge about how to handle various media and benefit from using the right equipment. Therefore, sharing doesn't stop here. There is a goldmine of knowledge and knowhow at DESMI and more knowledge will be shared in the future.

We have gathered some of the many articles that have been written so far. When you have time in your busy calendar, I recommend that you spend it on reading the articles – which also give you an idea of the many applications that our solutions can be used for – and why it is important to pass on this knowledge to the future customer.

I hope you will take inspiration from reading the articles – and if your head is full of case stories and knowledge to share, please remember this quote:

**Knowledge alone is not power. The sharing of our knowledge is when knowledge becomes powerful.**

Happy reading.

Karina Poulsen  
Marketing Manager

“ **KNOWLEDGE  
ALONE IS  
NOT POWER.  
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OUR KNOWLEDGE IS  
WHEN KNOWLEDGE  
BECOMES  
POWERFUL.** ”

# DESMI OFFERS A ONE-STOP SHOP FOR AQUACULTURE WITH A FULL RANGE OF PUMP SOLUTIONS

DESMI's new High Flow Low Pressure pumps fill a key need in aquaculture, boosting the company's portfolio of highly efficient and extremely reliable pumps for fish farming. While DESMI now can offer a complete supply of pumps for the aquaculture industry, the company is driven by the ambition to be one of the most important global pump suppliers for land-based aquaculture – as well as tackling the world's growing need for food.





As the aquaculture market grows exponentially to meet the world's growing food demand there is an equal developing need for reliable equipment. DESMI's new High Flow - Low Pressure pumps not only fill a key need, but they round out DESMI's aquaculture portfolio, meaning DESMI can provide a near full supply of pumping solutions for fish farming.

"Fish farms all over the world are now getting built, many more are being planned, and the trend is speeding up," says Jacob Foldager, Business Development Manager of DESMI Aquaculture.

"A technology shift is changing the need for pumps in the market", he says. "Previously, customers asked for large propeller pumps - both for Recirculating Aquaculture Systems (RAS) and flow-through systems. Today, land-based aquaculture farms are designed with dry-installed centrifugal pumps with high flow and low-pressure capabilities. Such pumps are more reliable, easier to maintain, and they can provide higher efficiency over a broader capacity span".

### **PUMPING INNOVATION FOR AQUACULTURE**

DESMI has been in deep discussions for several years with the OEMs of aquaculture systems to understand their requirements for pumps. "In that dialogue, it became quite clear how we should design the new aquaculture pumps to fulfil their needs. One example is that most piping systems in large fish farms are below ground, and it makes sense to have a pump that can pump the water downward instead of horizontally or upward". Thus, the pumps come in different configurations: horizontal, vertical, and horizontally downward. "This kind of configuration can make a big difference for many of these big fish farms".

DESMI named its new pump series High Flow - Low Pressure. The name relates to the fact that very large volumes of water need to be recirculated at very low pressure (0.2-1.0 bar) in RAS farms. Conventional centrifugal pumps are designed to have optimal efficiency at higher pressures, and therefore a different hydraulic design has been used for DESMI's new pump series.

Currently, DESMI is providing a large number of these new High Flow - Low Pressure pumps for large aquaculture facilities in Norway and Denmark. The new pump series is also relevant for wellboats, where the vertical configuration ensures circulation in fish tanks during transportation to and from the nets and pens.

### **MORE THAN JUST A PUMP**

Jacob Foldager notes that, in general, DESMI provides pumps with a very high efficiency and high reliability. The company's pumps have been used in various industries where reliability is vital, such as district heating, cooling, defence, industry, and marine. "That is where we come from. And for aquaculture, they must run 24/7, 365 days a year and sometimes in remote places. This reliability is truly essential".

With DESMI, customers do not just get a pump - they can get a full solution that includes a cloud-based, IoT surveillance solution. This IoT based pump monitoring can furthermore be integrated into the customers' SCADA systems.

### **GLOBAL AMBITION**

The new High Flow - Low Pressure pumps are built in an optimized, cost-effective design using modern tools such as FEM and CFD in the design-process. Added to that, the flexibility in downward configuration and the six different sizes are ranging from 200 m<sup>3</sup>/h all the way up to 6400 m<sup>3</sup>/h.

DESMI can now supply all the vital pump functions in the aquaculture industry. "This is a huge step for DESMI. It is helping us to achieve our overall ambition to become one of the most important pump suppliers to aquaculture in the world".



# DESMI OPTISAVE™ OFFERS SIMPLE POWER MANAGEMENT FOR ENERGY EFFICIENCY COMPLIANCE

Fuel savings and compliance with IMO efficiency regulations via intelligent power management for cooling pumps and fans from DESMI OptiSave™



Ship owners and designers need to comply with the maritime industry's ever stricter regulations for reducing CO<sub>2</sub> and greenhouse gas emissions. These new rules include the long-term Energy Efficiency Existing Ship Index (EEXI) and the Energy Efficiency Design Index (EEDI).

The regulations are part of the International Maritime Organization's (IMO's) strategy for reducing greenhouse gas emissions in international shipping by at least 40% by 2030 and 70% by 2050, compared to 2008.

The new measures will require all ships to calculate their EEXI following technical means to improve their energy efficiency and to establish their annual operational carbon intensity indicator (CII) and CII rating. Carbon intensity links the greenhouse gas emissions to the amount of cargo carried over distance travelled.

Ships will get a rating of their energy efficiency (A, B, C, D, E - where A is the best). Administrations, port authorities, and other stakeholders are encouraged to provide incentives to ships to be rated as A or B. A ship rated D for three consecutive years, or E, is required to submit a corrective action plan to show how the required index (C or above) would be achieved. For more information on this, please see this article's appendix at the bottom of this page.

Ship owners can implement several technologies to meet the requirements. One of these includes Energy Efficient Technologies, which focus on improvement of fuel consumption in auxiliary engines. The DESMI OptiSave™ Energy Saving System offers a cost-effective solution for compliance. It supports ship owners and designers to meet the requirement for reduction of CO<sub>2</sub> emissions. Such systems can be

integrated at the new build stage or as retrofit applications, fully integrated within the overall control systems. The OptiSave™ system is also suitable for vessels that will continue to be in service beyond 2030.

"You should install it regardless of the rules and regulations," says John Nielsen, DESMI's Key Account Manager of Marine and Offshore. "At the end of the day, you want to save fuel. And in doing so you help save the planet."

### **DESMI'S COMMITMENT**

When developing solutions to help improve vessels' operational performance and carbon footprint, DESMI's design engineers realize there is not a "catch all" solution for all ships.

"Fleet and operational patterns are so diverse nowadays. So, we tailor-make our OptiSave™ solution for every ship, so it achieves the highest possible performance," says John Nielsen. "We are here to support our customers with the best possible solution."

DESMI is committed to a better environment. The OptiSave™ system was developed with the sole purpose to achieve the highest possible energy saving for centrifugal pumps and axial fans. The OptiSave™ system is modular, meaning that it is expandable, and several other applications can be included.

### **THE DESMI OPTISAVE™ APPROACH**

The energy savings achieved using the DESMI OptiSave™ system often significantly exceed the pre-calculations made at the point of designing the system.

The background and optimization of speed of the centrifugal machinery is based on Affinity Law, which implies that as the shaft speed or impeller diameter changes, the horsepower

changes in proportion to the cube of the change in shaft speed or impeller diameter. In other words, impeller diameter is constant, so by varying the speed, the power consumption will also vary by ~3 times.

The law is expressed with the following formula:  $P1/P2 = (N1/N2)^3$  or  $(D1/D2)^3$

"Basically there is a relationship among flow, pressure, and power. So, if you reduce the speed, then you reduce the power," says John Nielsen.

By installing the DESMI OptiSave™ energy-saving system, shipowners will significantly increase the overall efficiency of vessels' cooling water systems.

### **HOW IT WORKS**

Sea cooling water systems and pumps are designed for operation in 32°C seawater and 100% engine load. Normally, they run as if this condition is permanent, all over the world. But actually, there are only a few hot spots where these conditions are present (see map). Otherwise, it is usually lower or much lower.

A standard vessel cooling system operating in these conditions around the world will be absorbing too much energy 95% of the time. The DESMI OptiSave™ system can regulate the energy consumption according to the actual cooling demand - thereby saving fuel as well.

The OptiSave™ system improves the ship's efficiency of the sea cooling water pumps, depending on the sea water inlet temperature and the overboard sea water temperature. Using the OptiSave™ system allows for an increase in the overboard temperature, increasing the heat exchange capacity, and cooling capacity, making it possible to reduce the power consumption to a minimum.

## A TALE OF TWO VESSELS

One can see the effectiveness of the DESMI OptiSave™ system by comparing the journey of two identical vessels traveling from Shanghai to Denmark. One vessel has no system, and the other one has a DESMI OptiSave™ system.

Already in Shanghai (water temperature 24°C), the OptiSave™ ship's pump speed is at 56%. Where the no-system vessel is running at 100% pump speed and 90 kW usage. The OptiSave™ ship is only using 22 kW.

When reaching the Mediterranean (20°C), the pump is running at half the speed of the "normal" cooling pump system of the OptiSave™ ship.

## THE DESMI OPTISAVE™ SYSTEM FOR SEAWATER

The OptiSave™ system controls the seawater cooling pumps by changing the pump speed according to the actual cooling capacity demand at any time, thereby achieving maximum power savings.

Each seawater pump has its own individually mounted, marine-approved variable frequency drive (VFD) for pump speed/flow regulation. A master control panel is in turn being fed with process information from the system's temperature and pressure transmitters. Sensors on the seawater inlet pipe measure the temperature to be able to control and calculate the amount of seawater needed to maintain adequate cooling of the freshwater side.

The temperature transmitters on the seawater outlet pipe are used to monitor and maintain a maximum discharge temperature. This is done to be able to extract the most energy out of the seawater as possible.

DESMI can also mount additional pressure sensors on the seawater side to measure the differential pressure over the central seawater coolers. The differential pressure measurement has the benefit of giving the OptiSave™ system the ability to prompt the duty engineer when back flushing of the coolers is necessary.

## THE DESMI OPTISAVE™ SYSTEM FOR LOW TEMPERATURE FRESH WATER COOLING

DESMI also offers an OptiSave™ system for Low Temperature Fresh Water (LT/FW) cooling where the control is formed by using pressure, temperature, and flow measurements to obtain the lowest possible energy consumption on the main LT/FW pumps.

On almost all commercial vessels, the LT/FW cooling system is designed for a cooling water temperature of 36°C at outlet (inlet to components). This temperature is traditionally controlled by using a PID controller linked to a 3-way valve with a valve actuator.

The 3-way valve will mix the hot LT/FW cooling water returning from components with the colder water coming from the main heat exchangers and keep a constant temperature of 36°C.

As opposed to the open seawater cooling system, the LT/FW cooling water system is closed and needs a certain amount of pressure to function.



When the OptiSave™ system is installed in an LT/FW application, the frequency converters will be programmed to a specific minimum RPM. This RPM corresponds to the minimum pressure setting where the cooling water system will perform as designed. The system maintains pressure using differential pressure measurements.

In order to monitor and control the performance of the system with lower pressure and hence reduced flow, a number of pressure transmitters and temperature transmitters are installed. Each of these sensors have the ability to control the frequency converters in the LT/FW system.

As an added function, the OptiSave™ system is designed to work with the temperature requirements set forward by MAN and by WinGD.

It is possible to increase the overall energy savings of the LT/FW cooling water pumps by adding shutoff valves for the individual components in the LT/FW system. The function of these valves is to close the waterflow through the components, when not in operation, and thereby reduce the flow further. As a result, the power consumption of the main LT/FW cooling water pumps is reduced.

### **ENGINE ROOM VENTILATION SYSTEM**

The DESMI OptiSave™ system also works in a similar way for the ventilation system in the engine room. Each fan has its own individually mounted frequency converter and a common control PLC for fan speed/air-flow regulation.

Each fan's VFD operates with information from the temperature sensor in the engine room, differential pressure measurements, and main engine fuel index measurements.

The system can also control the fire dampers according to operational condition of each individual fan. Dampers can also be manipulated in manual mode. As an extra option, the system is also designed to control the opening and closing of the exhaust louvres in the funnel. This function ensures a better control of differential pressure (overpressure) in the engine room.

The fans being operated by the OptiSave™ system will be operated at same speed, if running in AUTO mode.

### **RELIABLE OPERATION - ALSO REMOTELY**

The OptiSave™ master control panel includes a colour touchscreen for easy monitoring and system condition. It also includes a number of fail-safe modes. For example, if a wire for a sensor breaks, or if the master control panel is powered off, the pump speed increases automatically to 100% to ensure sufficient cooling.

Furthermore, all alarms and events are logged and can be transferred to the alarm system on the vessel. Remote support is also available for data logging and monitoring performance data - from any remote location in the world, no matter where the ship is sailing. The remote surveillance allows not only fault-findings but also to monitor performance of the system, says John Nielsen. "We do not need to go on board," he says.

The DESMI OptiSave™ system can be installed and commissioned in just four to six days, depending on the size of the system. It does not need modification of the vessel's safety functions but needs only minimum modification to the existing equipment.

"We can do turnkey solutions, we do the pre-calculations, we do the production and supply the equipment for the installation, and we do the commissioning," says John Nielsen. "There is no need to dry dock, and the installation can be done when the vessel is in service."

Currently, some 700 OptiSave™ systems are operating across different categories of vessels around the world.

One of these is Maersk Tianjin, oil and chemical tanker, from 2016. In that case, it was reported by Maritime Hawai'i in 2017, that a DESMI OptiSave™ cooling water system saved the vessel an estimated 116 tonnes of fuel per year. This resulted in 359 tonnes of CO<sup>2</sup> savings/year and considerable fuel cost savings.

For Maersk Tianjin's cooling room fans, the OptiSave™ system saved an estimated 32.4 tonnes of fuel per year, with 175 tonnes of CO<sub>2</sub> emissions saved.

As part of DESMI's commitment to our clients, we provide calculations that enable our clients to make decisions.

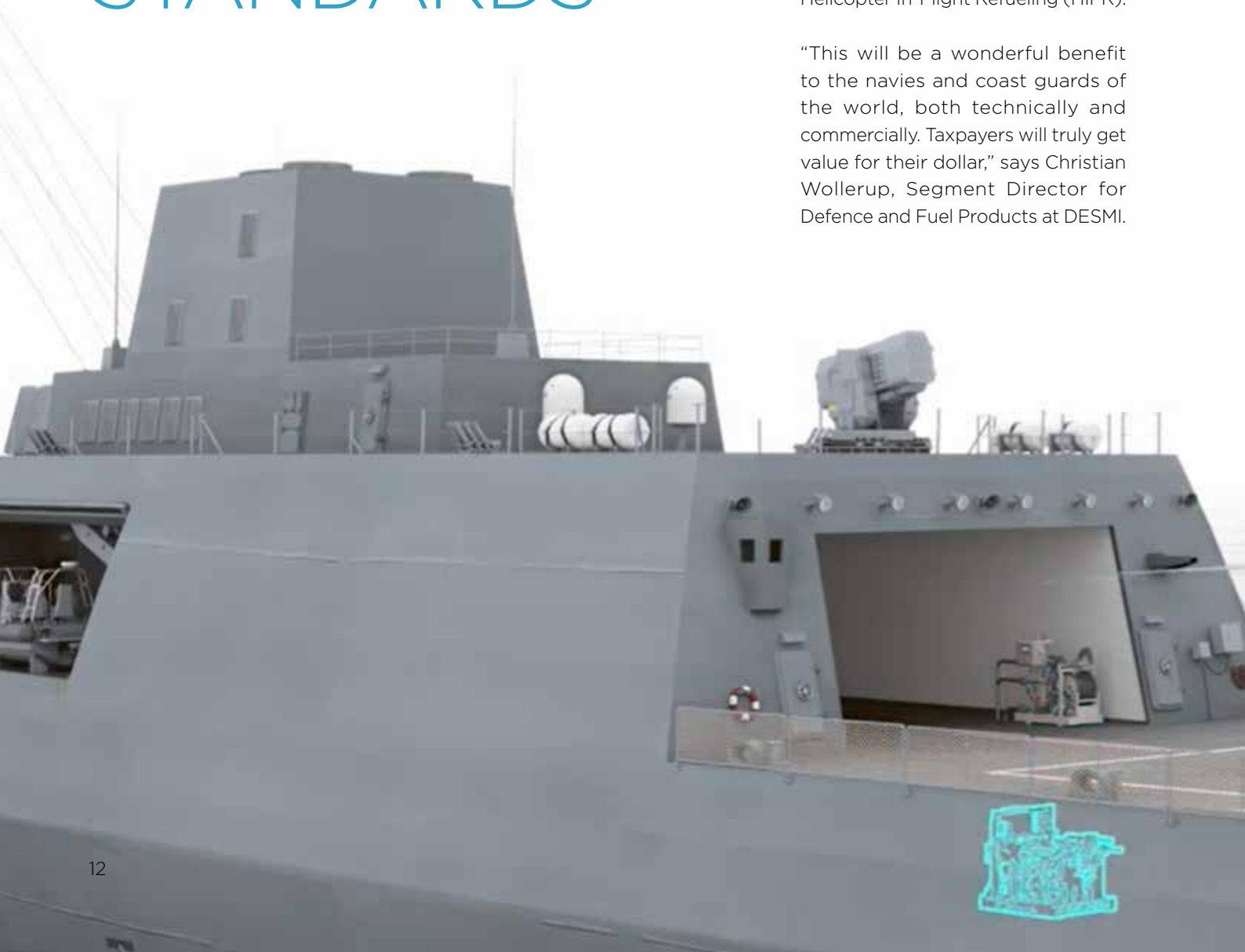
# EASIER & AFFORDABLE ON-BOARD HELICOPTER REFUELING AT NAVAL STANDARDS

DESMI introduces a new ship-based helicopter fueling system that not only makes it less expensive but also much easier to service and maintain.

Navies and coast guards of the world now have the possibility to get a ship-based helicopter fueling system with several advantages that not only make it better, but cheaper, too.

These advantages include a new, modular design for lower overall cost and faster maintenance, lighter weight, an improved user interface that makes it easier to operate, and an integrated logistics system. All of this is in a proven design at NATO STANAG standards. This includes options for both on-deck or Helicopter In-Flight Refueling (HIFR).

“This will be a wonderful benefit to the navies and coast guards of the world, both technically and commercially. Taxpayers will truly get value for their dollar,” says Christian Wollerup, Segment Director for Defence and Fuel Products at DESMI.





## MODULAR DESIGN

As a market leader in helicopter refueling systems, DESMI has previously customized each unit for every customer, depending on their needs. While that option is still available, it comes at a cost. So DESMI has introduced a system built in modules – where customers can choose among the different pieces that fit together – “a bit like Lego bricks” – into a whole unit, according to Christian.

The modules’ combinable pieces include pump units, filter units, control systems and dispenser units. Each module has up to several different options – with 21 modules in all.

For example, the customer chooses the type and number of pumps in the pump unit, the number of filters needed, the type of control system, and so on. The modularisation means DESMI can use standardised

products in each module, bringing the cost down.

Thus, customers in India, Singapore, USA, Canada, the UK, Germany, France, Italy or Spain can build a complete, modular system with the standard components for their own navy’s or coast guard’s specific needs.

In addition, the new design allows easy access to all components in the finished design for easy maintenance. “There’s basically not one component that you can’t replace within 15 to 30 minutes,” Christian says. “In other systems, it can take considerably longer. So basically, we’re reducing downtime during maintenance considerably.”

## LIGHTER AND SAFER

DESMI offers the new system in three different sizes: 230 litres per minute (l/m), 480 l/m and 680 l/m.

Each system comes with an optimized bottom plate in order to save weight and increase strength. Thus, ship designers will save 20% on weight of the helicopter fuel system with the new DESMI products – a benefit for warships that need to cut down on weight whenever possible.

In addition to the lighter base plate, DESMI has introduced vane pumps to the design. Fuel enters through a prefilter to the pump, then it passes through a safety valve and then a filter water separator. This filter, along with a brand new water barrier technology on the dispenser unit, serves the important purpose to make the fuel clean and dry. It separates water droplets down to 5 ppm, and it also removes solid contaminants. As of this writing, the water barrier technology is still in final testing. Once it is approved, DESMI will retrofit the new water barrier technology into new modular systems by just changing a pipe and





the filter, thereby helping customers to achieve even safer operations in austere conditions.

As with previous DESMI refueling systems, the new system is also optimised for HIFR operations – for refueling during extreme waves or weather, when it is too difficult for the helicopter to land safely on board. Also as previously, the system has been “designed from the tank all the way up to the helicopter,” ensuring safe and dry fuel in any operation scenario.

### **INTEGRATED LOGISTICS SYSTEM**

Naval and coast guard ships must have maximum operation time in their area, any day, every year, as long as they operate. DESMI has designed its logistics system with that in mind. The Integrated Logistics System (ILS) is a digital database with a maintenance manual, pictures, spare parts numbers, troubleshooting schematics and more in one package. It is made for the naval helicopter refueling operators and maintainers. In addition, technical and animated videos show in detail how the system works. The ILS is both in digital format and hard copy, in an easy to use format to minimise downtime and maximise operational capability.

### **IMPROVED USER INTERFACE**

The user interface makes the DESMI refueling system easy to operate for both the helicopter landing officer and helicopter landing assistants on the flight deck during HIFR.

“For the maintenance personnel, it makes me extremely happy that we have a system which is easy to operate and easy to maintain, should there be a fault. Easy troubleshooting,” says Christian Wollerup.

### **NAVAL STANDARDS**

The system is built by marine engineers for marine engineers. It complies with naval classification standards such as LR, DNV-GL as well as other classification societies upon request. The system also complies with NATO STANAG standards – not commercial standards. While a commercial system provider can supply a helicopter refueling unit for an oil rig in Southeast Asia or the North Sea, for example, naval and coast guard surface ships have different standards. DESMI’s maritime refueling systems comply with such standards.





They are designed to cope with “outside events”. In other words, DESMI can shock-mount the system so that it can sustain hits from torpedoes, missiles or mines and still be able to operate both during, under and after such an event.

“That’s quite unique. And that is what makes the difference if the

naval customer is requesting a unit to comply with naval standards,” says Christian.

The new system will be ready for the market in January 2021. When the COVID-19 travel ban is over, DESMI will be attending all major exhibitions to present the system.

Furthermore, DESMI offers classroom training or onboard training for its helicopter refueling systems. This is typically done by DESMI’s superintendent engineers, who have many years of experience with these systems – offering training in both automation and mechanics of the system.



# THE BENEFITS OF DESMI ONBOARD FIREFIGHTING SYSTEMS

In marine applications, DESMI's FineFog™ Fixed Water-Based Firefighting systems offer a safe, low-pressure alternative. After years of success in Asian-built ships, DESMI is now bringing its efficient firefighting products to the European market.

In Asia, DESMI is known not only for its pumps but also for its firefighting systems. More than 180 such systems are supplied to ship owners around the globe – though most of these are for ships built in China. There have not been so many installations in European shipyards, so DESMI's Marine and Offshore Sales Manager, Christian Møllergaard wants to reach out to European ship owners and shipyards to change this.

"They mainly know us for our pumps and might not know we offer these highly efficient firefighting systems – which of course include our pumps and offer some great advantages," he says.

DESMI has the following types of firefighting systems available:

- Fixed water-based local application system for machinery space
- Equivalent water mist fire extinguishing system for total flooding in machinery spaces and cargo pump rooms
- Water sprinkler system for accommodation

- Deck foam system for oil/chemical tanker deck protection
- Foam system for deck and helicopter landing areas
- Water spray/deluge/drencher system for special category spaces.

Ships will benefit from the automatic system around high-risk objects like combustion machinery, oil-fired boilers or burners, incinerators or purifiers for heated oil fuel. If there is an oil spill that catches fire, then the FineFog™ nozzles above that application are activated – based on a signal from flame detector or smoke detector – and the alarm sounds. The crew can still enter the room and continue with conventional firefighting with hoses. Or, if necessary, they can release the total flooding mechanism in engine rooms up to 5036 m<sup>3</sup>.

"And that's where our system has a big advantage over gas-based firefighting systems like CO<sup>2</sup>," Christian says. While CO<sup>2</sup> systems are effective, they come with a risk

to human life. "With CO<sup>2</sup>, if you have a fire on your engine room, you first need to evacuate everybody because otherwise the gas will suffocate them. And you have to make sure ventilation is shut off, and the room is completely sealed off. You must also ensure that all machinery in the engine room is stopped. This can take several minutes. In this time, a minor fire can grow quite large," he says.

"You only have one shot with CO<sup>2</sup> – you can only release the system once. And also, CO<sup>2</sup> has no cooling effect. So that actually means, the fire could reignite very easily. And afterward, you can't go into the engine room or confined space for several hours. You need to be totally sure that the fire is put out first before restarting ventilation of the engine room."

DESMI's FineFog™ total flooding by water mist offers a great alternative. "You can just start it right away. You can activate the main system, and people can be present, if needed – it doesn't kill them. It's just water. And it's non-toxic. And there's plenty of



it. At the same time, you have the cooling effects. That's one of the big advantages. It's effective, it only uses minimal flow rates, and it's easy. Pump from a freshwater tank or sea chest. The maintenance is easy compared to the regular inspections you need to do with CO<sup>2</sup> installations. And you don't need extra room for all these CO<sup>2</sup> bottles."

### PROTECTING ACCOMMODATION AREAS

For living areas, hallways, and other accommodation areas like cafeterias, DESMI offers its automatic water sprinkler system. The most common is a conventional wet-pipe system, meaning the piping is filled with pressurized water from a dependable source. It runs with low pressure.

It starts locally - Only sprinklers above or adjacent to the fire are activated to avoid water damage. *"It's very effective. In most cases, it will kill the fire in a very short time and maybe only with two or three sprinklers active."*

A similar, dry pipe system is available for areas where the water in the piping would be subject to freezing. In such a system, air or nitrogen fills the pipes until a fire activates the sprinklers. In that case, air escapes from the pipes and activates the dry pipe valve, causing water to flow from the activated sprinklers.

### LOW EXPANSION FOAM

DESMI's low expansion foam firefighting system protects oil and

chemical tanker deck areas, helidecks, or other open deck areas (like loading areas) and closed, horizontal spaces like streamer reel and purifier room. Water will not kill an oil fire. Instead you can apply foam, and this will form a 'floating blanket.' There is no vapor from the oil and the foam also cools the area.

The pressurized foam is delivered by a foam pump or from a tank to a mixing device. Then it is aerated and sprayed directly onto the areas of the fire.

### WATER SPRAY SYSTEM

DESMI also offers a water spray/deluge/drencher system with open nozzles. It is activated by a fire detection system, opening a deluge valve and letting water flow simultaneously from all the open sprinklers in a specific section. Deluge systems are used for protection against rapidly spreading, high-hazard fires on for example RO-RO and RO-PAX vessels.

Water spray is used to cool fires, and for crew protection on for example gas carriers or chemical tankers, where you cool down the whole deck area and surfaces with water spray.

Water spray is also required on vessels transporting class 1 material like containers and open hatch general cargo vessels.

For self-unloading vessels, water spray is used to kill or suppress fires in material and offloading equipment.

Systems can also be installed for dust suppression on these self-unloading vessels.

### THE LOW-PRESSURE ADVANTAGE

Christian Møllergaard says that of all the advantages of the DESMI firefighting system, the biggest is a low-pressure (max 16-bar) system. *"It's easy to install and you can use galvanized piping, which is cheaper. It's high precision, the maintenance is easier. This is where DESMI has an advantage over many of the other systems."*

In addition, up-to-date development ensures rule compliance and system reliability.

These include regulations from the International Maritime Organization's Maritime Safety Committee (MSC), the international convention for Safety of Life at Sea (SOLAS) and other regulations from Classification and Flag Authorities.

Plus, he adds, the system is designed with DESMI's own pumps and controls in mind. *"So, we calculate the pump sizes and design the system and make the drawings for the shipyards. And as you know, there are a lot of pumps on a vessel. DESMI can supply these, too. So, we can make an attractive package offer for both pumps and fire system."*



“Ninety-nine percent of pump breakdowns onboard ships are not due to faulty pumps. They are instead due to lack of knowledge or skills”, DESMI’s experienced sales engineer, John Nielsen says. Here is John’s list of recommendations.

# ENSURE GOOD WORKMANSHIP AROUND YOUR SHIP’S PUMP SYSTEMS

DESMI’s Sales and Application Manager in China, John Nielsen has a message for ship owners all over the world: “Be aware of how your pump systems are installed. Ensure good workmanship!”, he says. “That’s the bottom line. There are too many outfitting crews lacking practical experience.”

“Ship owners must thus make sure their site teams follow key guidelines for proper pump installation. Because most of the time, a pump breakdown is not due to a faulty pump”, John says.

“Ninety-nine percent of the time, a breakdown is linked to a lack of installation knowledge during installation. Or missing parts. Or incorrect operation – like starting the

pump without liquid inside – that’s a killer. It is linked to a lot of things”, he says.

With several years at DESMI and more than 20 years as a shipbuilder, John Nielsen knows what he is talking about. He offers a list of “do’s and don’ts” in pump installation for ship owners, superintendents, site teams and shipyards. “You need to be aware of these things”, he says. “A pump is just a component that will do exactly what it is designed to do. But if it’s not installed properly, then you can destroy it. It’s a bit like Murphy’s Law: If something can go wrong, it will. And in the end, the ship owners will have to bear the costs.”

## A SOLID FOUNDATION

Solid pump foundations are at the

top of John’s list. “It is extremely important that these are done correctly. The foundation has to be supported so there’s no chance of wobbling.” In other words, do not install the pump on a soft plate – a steel plate with no or missing support below. “There’s an old shipyard saying: You need the same amount of steel below the plate as you have on top of it.”

If the outfitting team wants to use weighted or spring-loaded supports, they must first check the design with DESMI or the steel engineer. “It is not up to the individual outfitting team to decide”, John says. “Most pumps today are vertical. And two-thirds of a pump’s weight is actually the electrical motor. Some pumps are four and a half tons meaning the



*electrical motor is three tons. This all calls for very good foundations to avoid vibration, etc."*

### **PIPES AND VALVES**

There are standard ISO rules for pipe routing, but these can be tricky to follow onboard a ship due to limited space. "So that means you have to think a bit alternatively," John says. On a ship, make sure that the pipe design allows the liquid flowing to the pump on the suction side at a maximum velocity of 1 meter per second (m/s). This is a rule of thumb so that you avoid creating water vortex or cavitation that will eventually destroy the pump. And then there are valve choices. On ships, a big number of valves are butterfly valves, mainly because this is an inexpensive valve type. But a butterfly valve only works

in the pumping direction. This is why there are always a non-return valve in series with the butterfly on pumps pressure side. Otherwise, if pumps are working in parallel and one pump is dormant without installed non-return valve, the active pump will pump liquid to the other pump instead - no matter butterfly valve open or closed.

Furthermore, it is important that the valves are full bore (full port). This means that when the valve is open, it has the same diameter as the pipe. Don't use valves that are slightly smaller in diameter than the pipe. This will create small vortexes inside the pipe and will eventually destroy the pipe and the valve.

### **THE SEA CHEST LINE**

Make sure the crossover line

supplying water from the ship's sea chest is sized properly. Sometimes, John Nielsen says, it is designed too close to the limit. This affects the flow rate and can cause pumps to lose suction. If this happens to the vessel's main sea water cooling pump, this could lead to shutdown of the main engine and loss of propulsion power putting the vessel and crew at risk.

At full load on the crossover, the liquid velocity should as a rule of thumb be maximum 0,7m/s. This to ensure a steady flow to pumps suction lines.

### **MATERIALS AND CORROSION**

It is also important to plan carefully for the pump material used, depending on the liquid it is pumping and conditions around it. Material



choices for pumps include bronze, nickel aluminum bronze (NiAlBz), gun metal, cast iron, cast steel, stainless steel 304, stainless steel 316, and duplex. "All of these materials have each their own advantages and disadvantages. It's important to consider these", John says.

DESMI typically uses stainless steel 316 or duplex for alkaline or acidic liquids, for example. "But you have to handle this material very carefully. You need to know what you're doing. Otherwise they can corrode."

DESMI designs its seawater pumps typically of NiAlBz for a designed sea water temperature of 32°C. Sea Water temperature above that becomes much more corrosive. Likewise, cast iron is not a good choice for seawater pumps in warm areas. "If you're operating in Greenland, then a cast iron pump can last a long time, but not if you're working in the tropics."

For low temperature freshwater

pumps, the DESMI design is using cast iron housing and NiAlBz impellers, designed for a water temperature of 36°C. "The problem with fresh water on a ship is that you need additives to remove oxygen as to avoid corrosion/rust. But there are many different kinds of additives and some of these make the water very viscous, and as result water can be leaking everywhere. Another problem with additives is that these chemicals change waters pH values. This is also something that needs to be considered when selecting materials."

Be aware of the potential for galvanic corrosion (also called bimetallic corrosion) when considering materials. This is a phenomenon that occurs when two different materials are put together – like copper and iron in salt water. Salt water will act as an electrolyte. "It's a slow killer", John says. "It takes a long time before you find out it is a problem. It is the same principle as used for protection steel with zinc anodes." In the case with copper and iron – the iron will

slowly move to the copper.

*"I think many people have experienced that calcium is building up inside pipes, etc. – this is also due to galvanic element effect."*

John's main advice about material choice is to look carefully at what is supposed to be used in different conditions and listen to the experts.

*"We see many cases where customers specify bronze. And yes, we can use bronze, but we prefer to use nickel aluminum bronze, because it is more rigid. And it's also better for avoiding galvanic element corrosion. So, this is the DESMI choice."*

*"One last word in this materials section, and that is related to how to increase the pump efficiency. Most pumps have an efficiency of 75-80%", John says. "Some ship owners require 80-83%. And this demands more than just an update of the mechanics. While there are many ways to do this, coating a pump internally with*



*a glass-like coating is the most common method. It is also possible to use an electrical control system to increase the efficiency. More and more shipowners are asking for the higher efficiency.”*

### **PRACTICAL ISSUES**

John has also made a short list of common mistakes – practical issues that must be considered. These are small issues around the pump. Although small – they still need to be considered:

- Make sure pipes are not under tension when you connect these to the pump.
- Make sure pipes are compensated for expansion and contraction due to different liquid temperatures.
- Make sure you have the means to lift the pump safely after it is installed in the ship. Otherwise maintenance can be difficult – some pumps are very heavy!
- And make sure you have the required tools and parts handy for pump and system maintenance onboard.

### **ELECTRICAL CONSIDERATIONS**

It is super important that traditional electrical installations follow the relevant classification society rules and standards from the International Electrotechnical Commission (IEC). This includes factors like correct installation, correct cable dimensions and correct cable temperature classes. *“This all has to be checked”, John Nielsen says. “And you must have self-extinguishing cables in case of fire. Cables must also be halogen-free. Big cables or small wires – they all have to comply with the same rules and regulations.”*

Ground connections must be done carefully, with the correct cable dimensions. *“No cheating”, John says. “That means, bottom line, the size of the ground connection wire must almost be the same as the main supply wire. So, if you’re using a 3x50 mm<sup>2</sup> power cable, then you must as a minimum use a 1x35mm<sup>2</sup> cable for ground connection.”*

A rule of thumb is to use the same wire cross section in grounding wires as used in the power supply cable to the individual components.

John would also like to urge consideration of where the potential ground connection is made. *“There must be no potential electrical differences between the grounding point for the same equipment. That means that if you have a motor starter, then the ground connection for that motor starter driving that pump is the same spot as where you put the ground connection for this electrical motor. This is also known as equipotential grounding. Because if you put them 10 meters apart, you can be very sure that there’s a difference in the electrical potential.”*

He says, *“there’s a common belief that just because you weld something to a steel plate, there are no differences in the electrical potential. But they are huge. Just the welding itself makes a difference.”*



- For electrical protection of pump and motor, there are two settings that are critical:
- The molded case circuit breakers (MCCBs) must be correctly adjusted and correctly installed. Settings on the MCCB is the maximum current stamped on the electrical motor.
- Setting on the thermal relay is according to the pump's non overload power, which is given from the pump's test sheet.
- So, the MCCB protects the installation and the thermal relay protects the pump.

#### **FREQUENCY CONVERTER**

The advice, and rules and regulations about using a frequency converter follows the above recommendations for traditional electrical installations. But you must take extra considerations, since the frequency creates electrical noise that must be managed. *"Make sure you at least have a common mode filter on a frequency converter when you do an installation. Larger installations may require du/dt filter."*

You must also make the correct adjustment of maximum current for a frequency converter – the same as you would do for the thermal relay in a traditional starter.

And then, when you want to use a frequency converter to operate your electrical motors, then you should seriously consider to increase the temperature class of the electrical motors to be one temperature class

higher. "Normally, the choice is Class F, which is 135°C. But when operating with frequency converters this will make your motors warmer due to the switching frequency on the motor supply line. So, we recommend: go up to Class H, which is 150°C. That will give you a bit more room to maneuver. And pricewise, it's small money."

### THE COOLING FAN AND IE2

Furthermore, make it standard that you want to measure the winding temperature inside the motor. That means that your motors should come with PT100 sensors embedded. Then we can measure it directly. And also, as this motor is often running at a very different RPM, then make sure you have an electrically driven cooling fan on top, instead of a standard mechanical one. Because when you run the motor at a low RPM, you don't have the same cooling capacity as you do when it goes at normal speed. But if you put in an electrical fan, you will have the same amount of cooling, no matter the speed of the load.

John Nielsen says, "when using a frequency converter, consider

seriously using normal rated IE motors – or standard efficiency motors. The reason for this is that you don't gain anything by increasing the IE class on the electric motor, if it's connected to the frequency converter. Because the summarized efficiency of the grid will stop at the frequency converter, meaning the grid's efficiency on the supply line is determined by the frequency converter. And the price difference between IE2 and IE3 or IE4 is significant."

### MORE MONITORING ADVICE

In addition to monitoring electrical motors' winding temperature, John says, "it is worth monitoring bearing temperatures – especially on important equipment. Furthermore, consider monitoring vibration levels – both at high and low frequencies."

"It's not unusual that we see a vibration level of 10 millimeter per second (mm/s). And the limitation for the pump – if we are really stretching it – is 7 mm/s. In case of an excessive vibration level, you might have to stop the pump to avoid damage to the pumps or pump parts. Remember, two-thirds of the pump's total weight

is still the motor – sitting on top of the pump casing, bearings, etc. So, if you have a three-and-a-half-ton pump motor literally jumping 10 mm/s, this is just like a huge hammer, knocking down on some small bearings somewhere. So – it's just a matter of time before this pump stops by itself."

There is also leakage monitoring. For big pumps that have grease-lubricated bearings, if the shaft seal starts leaking, very often it will leak straight down into the bearing. And grease and water are a bad combination. So, in order to avoid this, consider installing leakage detection sensors.

John Nielsen's alpha and omega advice is this: "Ensure good workmanship. That is the message. Especially onboard a ship."





# THE DRASTIC IMPROVEMENTS OF OIL SPILL RESPONSE OVER 50 YEARS

DESMI's expert in oil spill response, marine engineer Christian Ingvorsen, gives a big picture view on oil spills and their impact on how governments and the private sector have learned to respond to them over five decades



In March 1989, the Exxon Valdez oil tanker struck a reef off the coast of Alaska and spilled 37,000 tonnes of oil (257,000 barrels) into Prince William Sound. It was an environmental catastrophe with severe economic impact. It was also one of the big oil spills in the last five decades that served as a catalyst, pushing governments and industry to develop effective oil spill response.

DESMI's Christian Ingvorsen gives a lesson on oil spills and their impact, oil spill response and equipment.

### A DRASTIC DECLINE IN OIL SPILLS

It is important for Christian to make one thing clear in the beginning: as long as we need oil for heat and power, we will need to transport it. *"And whenever you transport something, there is a risk of accident,"* he says.

Christian Ingvorsen is a marine engineer who was educated in Maersk's apprentice system in the 1980s. At the start of the 1990s, he worked for Roulunds, which manufactured containment boom systems for oil response and was eventually acquired by DESMI. He also helped write the "First Responder Oil Spill Response" manual and do live courses of training in oil response for Denmark and the Baltic countries for the International Maritime Organization (IMO).

So, let us start with some good news. Ship-based oil spills have reduced drastically in the last five decades. In the 1970s, the average number of spills per year was 78.8. By the 2010s it was 6.2. That is according to the International Tanker Owners Pollution Federation Ltd. (ITOPF), a non-profit organisation established on behalf of the world's shipowners to promote an effective response to marine spills of oil and other hazardous substances.

Christian Ingvorsen says there are three main reasons we have 12 times fewer oil spills today compared to 50 years ago.

First is that today's vessels are better, with a double hull. *"Second, you have standard operational procedures now. When I was young, you didn't have any manual to tell you what to do and in what steps. You just had the guy next to you tell you, 'Do this and do that.' You didn't get any proper training. So the risk for you doing something wrong was much bigger that time. Thirdly the entire world has changed its attitude towards safety and being 100 % concentrated on your professional duties"*

### BIG SPILLS AND IMPACT

Christian points to four spills that have had impact on today's oil spill response policies and guidelines.

In 1967, the Torrey Canyon ran aground on a reef on the southwest coast of the United Kingdom. It spilled 100,000 tonnes of oil into the English Channel, leaving beaches knee-deep in sludge. More than 15,000 sea birds were killed. It was the first major oil spill in British and European waters, leading to changes in the way people viewed the environment.

*"It was the first time we realized: Whoa, something could happen. And it made a huge impact on the environment, because at that time, we didn't have any sort of specialized equipment for actually recovering the oil,"* Christian says. *"So they sent in the Navy and the Air Force. They were trying to bomb the area to burn off the oil. And they used a lot of chemicals, which caused more damage than the oil itself."*

This also encouraged a number of European countries to build up their national contingency plans. That includes Denmark, which also formed

its Ministry of the Environment in 1971.

Another big spill happened in Europe in 1978, when the Amoco Cadiz sailed into some rocks on March 16, 1978. It spilled 223,000 tons of light crude oil, spoiling a large part of the Brittany coast.

### AN ALASKAN DISASTER

After two weeks, President George Bush declared a national emergency, and then a lot of things started happening. For its part, DESMI went to all its customers around the world and asked for their usable booms, then made an immediate shipment of 10,000 metres of booms and equipment to Alaska to help with the spill response.

Meanwhile, the environmental impact was massive as well. Seals, birds, otters and other wildlife were covered with oil. Just a drop of oil on a bird or mammal will affect its insulating abilities, causing the animal to freeze. A groundswell of volunteers also came to this remote part of Alaska to help clean the animals with detergents.

*"What happened was that a lot of the birds died due to stress. You have to catch them, then wash them, then put them in small cages to dry and maybe even use a hair dryer to speed up the process,"* Christian says. An estimated 100,000-250,000 seabirds died, as well as nearly 3,000 sea otters and hundreds of seals.

Beach cleaning was done with high-pressure steam. *"What they realized 10 years later was that these steam cleaners removed all the bacteria and simply killed them. So the long term impact of cleaning so efficiently was much bigger than from the oil itself."*

The lesson formed today's beach-cleaning practices. *"They learned that you must use the water from from*



*the same environment to clean with. So you should use salt water if it's a saltwater environment, because the bacteria cannot survive in freshwater."*

By the 2000s the oil spill response practices were improving. This can be seen in the biggest spill in Danish waters, known as the Baltic Carrier Incident. The spill was due to a oil tanker collision in the Baltic Sea north of Germany in March 2001, spilling more than 2,000 tons of oil that drifted north to Danish waters. Uniquely, despite (or perhaps because of) the very viscous oil, the authorities managed to recover some 60% of the oil in the water. *"This is far beyond normal, where a good operation may recover some 30% of the oil when still in the water,"* Christian says, adding that the cold temperatures and type of oil meant evaporation rate was low.

### **OIL SPILL RESPONSE**

*"So if you have an oil spill in Denmark, if you're the one observing, you should call the Police. They will be the first responders, and they will then call the appropriate authorities,"* Christian says. Then the Danish Navy will take over if it is an offshore spill. If the oil hits the shoreline, the affected municipality has

the responsibility for beach cleanup.

In the US, the Coast Guard has authority for initial response, along with the US Navy. In general around the world, the national authorities are responsible for the clean up operation and legislation. However, some countries have their own response teams, and other parts of the world use private contractors for their response teams.

In the United States, the Oil Pollution Act of 1990 requires that tankers may not enter US waters unless they have an agreement with a private contractor who can help respond to a spill. Ship owners caught not following this rule are simply banned from sailing in US waters ever again.

Response falls into two general methods: mechanical or chemical recovery. Europe and the US focus mainly on the former, meaning you physically remove the oil from the water. It is generally seen as the better way environmentally but more expensive.

For chemical recovery, you put chemicals on the oil slick. This removes the surface tension of the

oil, separating it into small droplets, which eventually sink. Then nature takes care of the oil – a process that takes a long time.

Mechanical recovery involves using oil containment booms, oil skimmers, sweep systems and more. As one of the world's most experienced manufacturers of oil recovery systems, DESMI offers many different variants of the above, as well as training and more

Christian says that besides having the right equipment, one thing is vital: *"Training, more training and even more training! People need to know how to use the equipment under stress, because you will always be under stress in such a situation. We so often see that because training costs money, it is not always continued after the initial purchase. But your people must know how to use the equipment in stressful conditions."* Training involves creating a line of communication on who does what, as well as learning to work around the slippery oil equipment without causing injuries.

*"It's all about communicating who is doing what and what kind of*





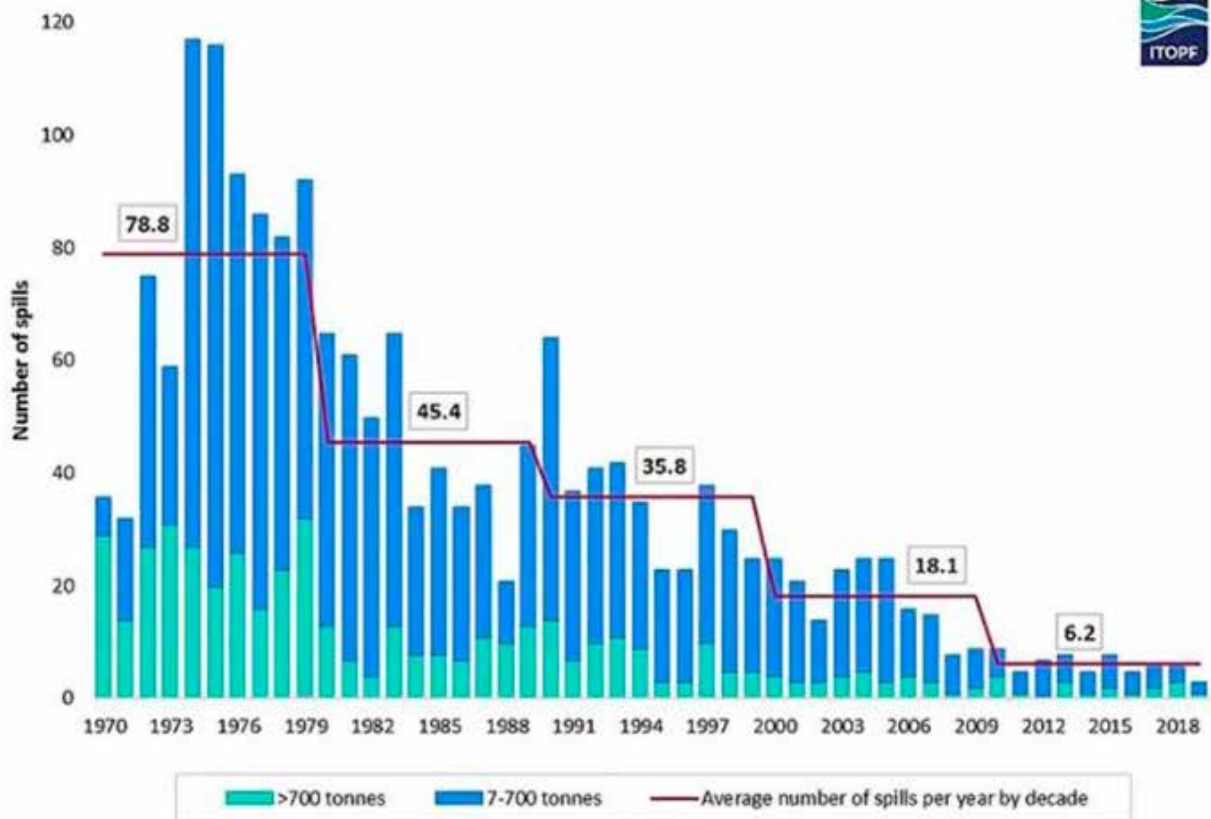
expressions are we using? What kind of terminology? An interesting challenge is if you have two vessels and they are from different countries, and they need to communicate very precisely to recover the oil. This is first of all difficult under all circumstances, but the fact the one of the captains is in charge of the second captain can

cause some communication issues.”

Every year the nine countries bordering the Baltic Sea participate in a drill, using different vessels, often using popped popcorn as the “oil”. Regional cooperations like this exist all over the world. However, Helcom – the name of the Baltic Sea

Cooperation – is considered as one of the most successful.

“When your people are properly trained and have practiced a response regularly, then they feel confident with what they should do. You save a lot of time, you solve the problem, and you build confidence.”



# DIGITAL OFFLINE TOOLS OFFER E-LEARNING

Marine engineers and crew members can now train and learn about DESMI Ocean Guard's CompactClean ballast water management system with two digital offline tools. One is a computer-based training (CBT) program and the other is a mobile app.

While the e-learning tools were in development long before the Covid-19 pandemic, they come at a good time, says Mark Kalhøj Andersen, Technical Manager and Head of Projects and Engineering, DESMI Ocean Guard.

*"It's a huge benefit to have these tools when we are in a situation where people can't meet," Mark says. "We developed these as a way to reach out to all of our customers and also internally in the organization with a training tool that would enable us to distribute knowledge in a fast and efficient way. Our customers are located all around the world with limited access to internet, and it's not possible to run everything online.*

*So we need to be able to distribute offline services that can be operated by downloading the tools when you have internet and then operating them offline."*

The tools will help vessel owners to educate the crew about ballast water legislation. They also help marine engineers to understand the ballast water management system: what it is, how to operate it, and how to maintain and service it.



*"These tools can - within one full day's training - bring anyone who has to operate or maintain the system from 0% knowledge to 80%," Mark Andersen says. "The last 20% is the hands-on part."*

## COMPUTER-BASED TRAINING (CBT)

The interactive training course starts with a general description and gets more detailed as the user moves through sections on process and instrumentation, hardware and software, troubleshooting and maintenance.

The interactive features help users dive deep with detailed diagrams, pictures and pop-up descriptions of *"what is this and why is it relevant for you?"*

Users can click on different fields or markings in the diagrams. For instance, the program offers a lot of information on item numbers for spare parts, shown in all system sizes. Users can thus learn how the process and instrumentation diagrams can help in the future of operating their systems, as well as how the tool will help them to install and understand the entire product.

By clicking through all the features, users will gain knowledge about how the system is put together on a detailed level of processes and instrumentation.

Likewise, the hardware section takes users all the way down to the smallest components and all the additional features. The software section runs users through the entire process of operating the system with the HMI, human-machine interface.

*"By executing this section, you will understand how to operate the BWMS,"* Mark Kalhøj Andersen says.

The simulator section is an interactive tool that gives a three-dimensional visualization of the system. Users can click on different features, like operating the valves. *"You can click on the HMI. You can learn to operate the system in a digital 'hands-on' way,"* he says.

Additional chapters feature troubleshooting and maintenance. A test section gives users an indication of how well they have understood the system (a 70% result gives a test "pass").

To get your free copy of the CBT tool, visit CompactClean CBT or send a request to DESMI's BWMS support (ServiceDOG@desmi.com).

### SMARTPHONE APP

The DESMI CompactClean App, available for both Android and Iphone platforms, is an interactive training and support tool. Once you download the app, you can use it offline.

The app is a visual, interactive maintenance manual. In other words, it is a disruptive interactive manual for a smartphone, to train and support the user in a new and effective way. It also has a 3D visualization element,

where the user can drop into specific maintenance sections for every single component by pressing the dot on the component.

Additionally, a frequently asked questions section offers quick answers to the most common queries.

The app also features an augmented reality (AR) tool. Users can point their camera toward a plain surface, press a button, and a 3D version of the system appears on the floor of the room where they are standing. *"You can walk around this system. And you can press on the different components to investigate what it is and how to do maintenance and service" says Mark Kalhøj Andersen. "If you don't have an actual physical system yet, but you know you're going to, you can do the initial training in a digital 3D version with your smartphone. It's super cool."*

### PHYSICAL TRAINING FACILITY

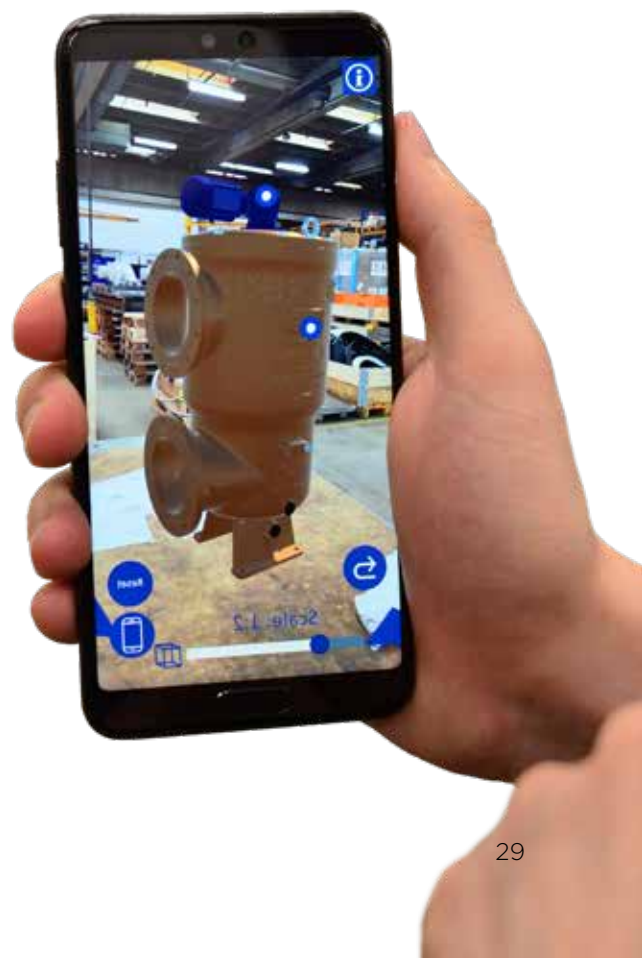
DESMI has long used the facility for not only customers, but also to train its own service engineers and new employees with a physical installation of the entire ballast water management system. Additionally, the facility enables DESMI to further develop and test new features to the system.

A physical training facility is also located at DESMI world headquarters in Nørresundby, Denmark. *"We are most happy to invite customers to our physical training facility as well,"* Mark Kalhøj Andersen says – that is, when the global Covid-19 situation clears and again allows safe international travel.

DESMI has long used the facility for not only customers, but also to train its own service engineers and new employees with a physical installation of the entire ballast water management system.

Additionally, the facility enables DESMI to further develop and test new features to the system.

Mark says there is one extra digital feature at the physical center that is a must for visitors: the HoloLens 2 AR headsets. *"You put on these goggles and enter into an augmented virtual environment,"* he says. Like the mobile AR app, you can walk around a virtual version of the CompactClean system and interact with it, but the headset environment is a deeper step into the digital world. *"You can physically with your hands operate the BWMS, open different components and look inside while walking around the product with these goggles on."*





DESMI ROTAN® Chocolate pumps humbly deliver reliability for confectioners

# THE CHOCOLATE RIVER KEEPS ON FLOWING

## KEEPING HEAT AT BAY

One of the key issues continuously facing confectioners is heat. Pumping chocolate is a delicate process and it's easy for production to get clogged up, literally. Pumps that operate too fast or under too much pressure result in turning the heat up on a product that is very sensitive to temperature.

*"Anyone who has ever tried to make chocolate on the stovetop knows that overheating chocolate results in caramelization, or a coarse, flaky end product, not at all conducive to*

*keeping pumps turning smoothly. In a chocolate factory, heat is quite literally the enemy."*

The different varieties of chocolate, dark, milk, white, and other compounds, require different processing, and due to varying sugar contents. The greater the sugar content, the greater its sensitivity to heat and the chances of pumps seizing up.

Dark chocolate is the easiest to move, allowing for the use of smaller pumps that can operate at high rotating speeds. The trickiest is white

chocolate, which is entirely sugar and cocoa butter and therefore extremely sensitive to heat. White chocolate pumps at a much lower speed than other varieties, taking care to avoid over caramelization of the sugar.

## ONE PUMP, IN DIFFERENT SIZES, FITS ALL

DESMI first developed the ROTAN® pumps over 50 years ago. The innovative design has continuously passed the test of time and its consistent, high reliability has meant only incremental improvements over the years.

DESMI has developed a variety of the ROTAN® pump, with special configurations for chocolate, called the CHD pump. These pumps are designed for pumping anything from standard chocolate to cocoa liquor to caramel. Equipped with a heating jacket on the front and rear end, components like rotors, idlers and idler bushings are designed with special clearances, enabling them to handle pressures of up to 12 bar, or a PSI equal to 175.

### **WHAT'S THE KEY TO ITS ABILITY TO OPTIMALLY MOVE ANY VARIETY OF CHOCOLATE WITHOUT SEIZING UP?**

Delivering one tried-and-true pump, in multiple sizes. While the modular ROTAN® pumps are nearly identical as they move from small to large, each size variation rotates at a different speed. So, for example, a manufacturer can use a small, high-RPM pump for its dark chocolate production, and a much larger version of the same pump, rotating at a slower speed to accommodate its white chocolate production line.

### **BETTER THAT IT'S BIGGER THAN NOT BIG ENOUGH**

*"Chocolate confectioners are often, understandably, protective about their specific recipes, so we often need to make recommendations about what will serve customers best, without knowing every detail of the compounds that the ROTAN® will be moving,"* Charles Womack says.

This can make it challenging at times. However, because DESMI offers the ROTAN® pump in several sizes, it's often possible to find a solution that can optimally suit the customer needs with few compromises.

*"When meeting requirements, we believe it's best to err on the side of delivering a bigger pump than necessary, rather than a smaller one,"* says Womack, noting: *"It's always better to have to slow a pump down*

*than to have to speed it up to meet a customer's need."*

Additionally, the modular nature of the design allows for the efficient replacement of worn components in multiple pumps, no matter what the size, as the pumps share many commonly replaced parts such as, bushings, shaft, O-rings, and ball-bearings etc.

### **THEY'VE KNOWN US ALL ALONG**

*"Recently I toured a well-known confectionary factory to consult for pump replacements and end up walking by a series of our ROTAN® pumps in a different part of production,"* says Womack.

*"It's always great to talk with these engineers and be able to point to our pumps in a machine that has been moving chocolate problem-free for ten years."*

Because DESMI often sells CHD pumps through OEMs who ship machines all over the world, this is a common occurrence. Many confectioners don't even realize the pumps that have been working faithfully for them over the years are DESMI ROTAN®s. And because of this, when DESMI consultants have the opportunity to refer to these pumps during a consultation, they often find that the product has literally sold itself!

### **LEAK-FREE DESIGN**

Because chocolate is expensive, a leaky pump is quite literally leaking money. Charles explains:

*"If a pump leaks product, then you're basically just shoveling up profit from the floor. In the past, many pumps actually incorporated controlled leakage into their design as a means of keeping heat down between the shaft and the packing. However, the ROTAN CHD is designed to be a leak-free pump. When it leaks, if ever, it*

*means that it's time for maintenance."*

And maintenance is easy and quick, thanks to its true back-pull-out design, which allows inspection and repair of the rotating cartridge without disturbing any piping or coupling alignments.

### **MORE PRESSURE, MORE PROBLEMS**

Many confectioners operate factories that have existed for many decades. In many cases, the production setups could almost be considered antiques, with complimenting infrastructure that may be well in need of an update.

*"Oftentimes, customers are looking for us to act as a consultant of the applications, not just sell them pumps. We often advise on how they can set it up to give our pump the best reliability and performance,"* Womack says.

The ROTAN® pump improves production outcomes in most installations, although optimum performance will result from surrounding pipe infrastructure that takes unwanted forces, such as pressure, out of the pump. More pressure, after all, generates more friction. And friction generates heat. And heat is, again, the enemy of chocolate production.

### **RECESSION-PROOF**

The world loves chocolate, that's for sure. Chocolate manufactures are running factories 24/7 to meet demand, even during times of economic downturn. This means it is absolutely crucial for confectionaries to avoid downtime.

That's what makes the reliability of the DESMI pumps so important to some of the world's largest manufacturers. With the hard-working ROTAN® CHD in place all across the globe, no one need worry that the chocolate river will stop flowing anytime soon!

Across almost every industry sector in many parts of the world, chlorine-based refrigerants have been phased out due to their impact on the earth's atmosphere. As new, more climate-friendly refrigerants have been introduced in industrial refrigeration systems, special types of lube oils are needed to lubricate the compressor's moving parts.

This places special demands on lube oil pumps. For example, elastomers and other materials in the refrigeration system must be compatible with the new refrigerants and lube oils. Mechanical seals and static sealing need to withstand vacuum suction, due to the water-absorbing, hygroscopic characteristics of new refrigerants. This makes it necessary

to remove any aqueous vapours from the installation before it is filled with oil. In addition, today's sustainable refrigerants often demand a higher design pressure.

DESMI's ROTAN® pump meets all of the demands for a lube oil pump for modern refrigeration systems.

Based on a well-proven design from 1915, it has been continually modified in close co-operation with refrigeration systems manufacturers. Today, its unique, modular concept is generally recognised as the most advanced internal gear pump design available.

Ricky Frampton, General Manager at the DESMI Dubai Office explains

# LEADING THE WAY IN LUBE OIL PUMPS





that DESMI works hard to respond to crucial market developments, listening to the ever-changing needs of customers. *"To meet the stricter requirements for sustainable solutions in the refrigeration sector, we have modified our pumps over the years based on the input from various key customers,"* he says.

### **VITAL COG IN THE WHEEL**

A lube oil pump may be a seemingly minor component, but it has a vital function to play ensuring the entire refrigeration system works as it should.

*"It just has to work,"* says Ricky Frampton. *"Refrigeration systems run non-stop, and the lube oil pump needs to keep delivering. But we pride ourselves on this, and there are many cases where the ROTAN® pump has run for years without the need for maintenance - sometimes up to 35 years."*

If anything, the pump's importance to a well-functioning refrigeration system is increasing.

Companies everywhere are universally focused on reducing carbon emissions and energy consumption. All the individual parts of a system have a role to play - including the lube oil pump.

*"Our customers are demanding higher quality equipment that helps them meet their environmental responsibilities,"* says Ricky Frampton. *He continues: "It's not just down to good equipment, however. As a reputable supplier, we have to be aware of the wider implications ourselves. So we put a lot of effort into making sure we understand how we can support reducing emissions of harmful gases and creating more energy-efficient solutions. It's become a very important competitive parameter."*

### **STANDARD AND CUSTOMISED PUMP SOLUTIONS**

DESMI's ROTAN® products are built to pump mineral oil, alkyl benzene, polyalphaolefin, polyglycol, and polyolester oils that contain a small amount of coolants. With a superior ability to handle high-pressure systems and a wide range of viscosities, they provide excellent protection against leakage.

It is an internal gear pump with superior self-priming capabilities that pumps in both directions and ensures gentle handling of the substances.

The pumps feature a "back-pull-out" system, which allows inspection/repair of the rotating cartridge without disturbing the piping or coupling alignment.

DESMI offers standard ROTAN® pumps as well as customised solutions for specific purposes. With its straightforward, compact construction, the ROTAN® GP pump range is a low-cost, monobloc pump unit suited to closed refrigeration systems. The ROTAN® PD pump range is designed for refinery and petrochemical applications and is ideal for Oil & Gas markets.

### **A STRATEGIC MINDSET**

The key to providing the right pump for a specific need is to take a strategic, solution-based approach, says Ricky Frampton. He explains:

*"Our business is founded on the idea of developing customised solutions in co-operation with customers - and then to back this up with first-class after-sales service. ROTAN® pumps have been developed based on feedback and input from our customers, who are mainly large refrigeration systems manufacturers."*

*"We gain a thorough understanding of how the pumps must support the specific refrigeration system and then work with them to deliver just the right solution."*

# DESMI & NAVAL NEEDS A PERFECT PARTNERSHIP

A strong track record of providing pump solutions for the defence industry gives DESMI a deep understanding of naval applications – and the Danish-based supplier has everything it takes to meet complex naval needs.

## COMMERCIAL BENEFITS – TRANSFORMED

Most navies know DESMI as an established maritime brand, serving the commercial shipping industry for many years. Commercial shipping is a tough, demanding environment with little room for poor quality or design errors. Large container ships, for example, go on voyages lasting up to five years, making sturdy and reliable pump solutions absolutely critical.

It's this depth of experience that enables the Danish-based company to adapt its well-proven products and technologies to meet the even tougher demands of naval operations. Naval customers benefit directly, too, from DESMI's commercial activities, leveraging an established supply chain and high availability of spare parts.

## TRUSTING PARTNERSHIP

Martin Bro, DESMI's Defence and Fuel segment director, knows just how important it is to do things right. *"DESMI and its navy customers share a common goal: that of bringing sailors back to shore safely and helping*

*to make working on board as smooth and efficient as possible. Key to this is the ability to analyse specifications throughout the entire process, delivering the best possible system and aiming for high operational uptime and reliability."*

Much of DESMI's success results from the collaborative relationships it typically establishes with customers. This partnership approach creates the trust necessary to probe into the needs of the fleet and constructively challenge product or configuration choices – often discovering innovative alternatives that may not have been previously considered.

## TRAINING FOR SUCCESS

It can be a struggle for navies to provide their personnel with expertise that extends beyond the instruction manuals of onboard equipment. Helicopter refueling, for example, is certainly more involved than simply pushing a green button!

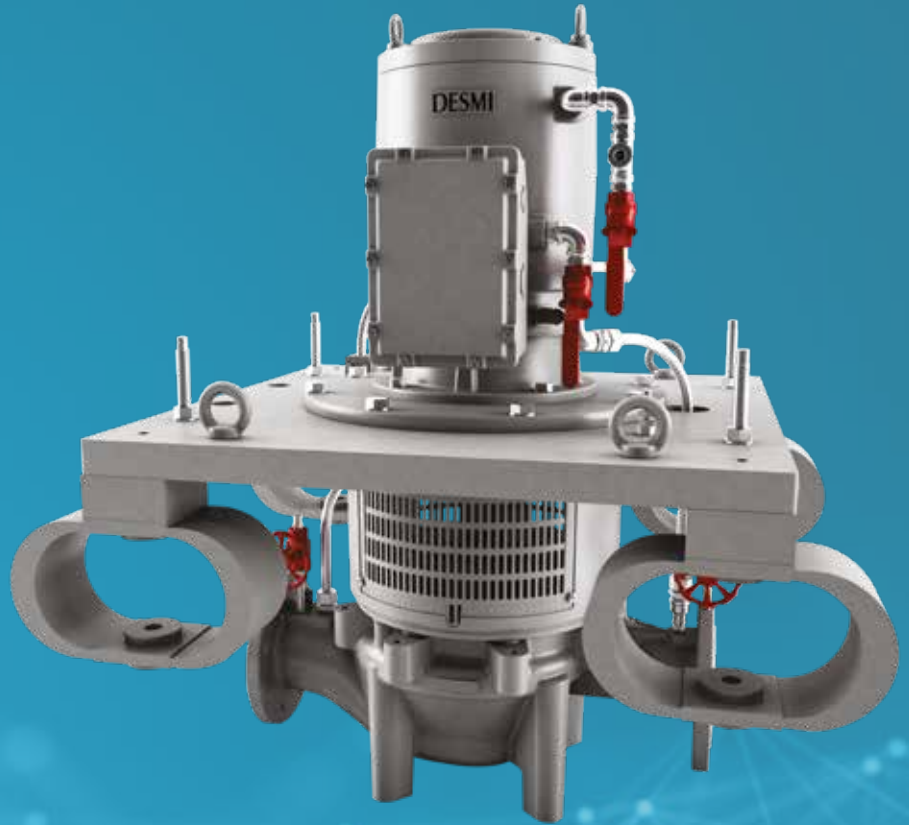
To meet this need, DESMI solutions often include crew training, giving naval personnel the technical know-how and confidence to operate the equipment effectively. Depending on the solution, training can span two to four days and focus on relevant health and safety aspects, too. At the end of the training, operating skills are carefully tested – leaving no doubt that the necessary competencies are in place.

## TAILORED TO NAVY SPECS

Navies operate in extreme conditions – a typical day could mean freezing rain, rapid accelerations, huge temperature swings, intense salt fog, or even gunfire vibration. And navy ships need pumping systems that are up to the task. DESMI's shock-rated pumps, for example, have the durability to weather the most challenging environments – and DESMI's people have the know-how to recommend the best solutions.

A dedicated team works closely with navy customers to customise off-the-shelf commercial products, transforming them with specialised materials and features to deliver the ideal fit. By adapting their standard range to Military Off The Shelf (MOTS) equipment, DESMI provides navy customers with cost-effective, reliable pumping solutions – all while addressing their exceptional shock requirements.

DESMI knows that naval applications come with stringent documentation requirements – and ensures that all products live up to these. Beyond supplying standard manuals for DESMI products, the company can provide integrated logistics support



and technical drawings, adjusting these as necessary throughout the process and working with shipyards to ensure everything meets the specifications.

#### **SUPPORT THROUGH SERVICE**

While many navies take care of their own equipment, DESMI stands ready with a range of service agreements. The company's service technicians have the necessary security clearances and skills to work aboard naval vessels, and DESMI labs are equipped for additional testing, such as measuring noise vibration, where required.

Proving that innovation extends beyond the pump systems

themselves, DESMI technicians sent to service naval vessels typically arrive equipped with specially designed spare parts kits. Each kit has a clearly visible, unique NATO order number, showing precisely which pump type it fits. And every kit contains all the parts necessary for the pump, from O-rings to bearings, shaft seal and more. As a result, repairs can be made more quickly – and ships are less likely to be delayed.

Ready for the next challenge From shock-rated pumps to helicopter refueling systems and everything in between, DESMI has the confidence to back its products through robust warranties that can be adapted to fit navy requirements. And with a willingness to deliver products that meet exacting requirements and a commitment to building trusting relationships, DESMI will continue to expand its list of naval customers well into the future.

#### **PACKAGE DEAL**

Today, DESMI supplies not just stand-alone pumps, but fully equipped and optimised systems. For helicopter refueling, for example, the pump is just the beginning of a solution that expands to incorporate pipes, meters, valves and hoses until it becomes a fully configured, purpose-built skid.

In fact, DESMI can go much further than this. Take DESMI OptiSave™, for example, an automated sub-system that optimises pump and fan speeds to meet current requirements – with significant fuel savings as a result.

As Martin Bro explains: *“Today, our navy customers are buying fully tested and approved, plug-and-play solutions from a single supplier. And they can choose a comprehensive service plan from us, too.”*

Developing and supplying reliable pumps is only part of the equation for DESMI. State-of-the art field service gives customers peace of mind, wherever their pumps are installed and whatever the configuration.

### FULL-SERVICE OPTIONS

DESMI supports pump systems installed at everything from district heating plants to battleships. Differing types of service are available for differing client needs and the deep know-how of the field engineers allows them to maintain competitor brands, too.

If a pump breaks down, the Fix on Failure solution brings in field engineers to overhaul the system and determine if the issue is due to wear or an installation problem. For a more proactive approach, DESMI offers preventative maintenance contracts. These define service intervals to verify that everything is running properly and assess the risk of failure within the next contract period. The condition-based service approach takes proactivity even further, with engineers coming in at shorter intervals and ensuring every time that overall performance is as efficient as possible. These regular visits let DESMI's engineers monitor the pumps and also check that bearings and other potentially worn parts are operating as expected. Such check-ups ensure that pumps operate at their highest efficiency – and can result in big savings.

# DESMI'S FIELD SERVICE

## MUCH MORE THAN JUST A MAN IN A VAN

### SERVICE THAT PAYS ITS WAY

Just how much money can be saved? According to Johan Schwerin, DESMI's Service Manager, "Restoring a loss of perhaps 5 percent in efficiency (with a 55kw motor or larger) can easily pay the cost of a service visit in sheer energy savings."

DESMI field engineers are usually able to deliver savings on their first site visit - often through some fairly simple adjustments to correct the pump farm not running as efficiently as possible. In fact, the company offers an initial service visit for free because long experience shows that there is almost always potential for optimisation. And there's often no charge for the first service visit if no improvements can be identified. "We experience more and more often that if there's a problem with the customer's installation, it's not the pump that is at fault," explains Johan Schwerin. "Instead, the installation

may be poorly suited to the pump (or vice versa), or the pump may have been incorrectly installed. Usually, a visit from a service technician can take care of such problems."

### EXPERTISE IN ACTION

In a recent case, DESMI received an urgent call for help from a shipbuilding client who had run into a problem installing a number of the vessel's pumps. The motors on four NSLH (horizontally mounted) pumps needed to be turned 45 degrees to suit the installation. And the deadline? ASAP, of course.

Within three hours of the client's call, a service technician from Denmark was on site – and he was joined shortly after by a DESMI colleague from Germany. By the time the DESMI technicians left the site at 10 pm that evening, the work for all the pumps had been completed and the client was able to install the system as planned.



## **DONE RIGHT - RIGHT FROM THE START**

When installing and commissioning a pump or pump system, it's worth getting a DESMI field engineer on site to help ensure the installation is correct and that the pump gets a good start. Confirming that a pump system works at its best duty point from the outset maximizes results and means it's likely to last longer, too. It is particularly important to ensure a correct start for pumps and pump systems to avoid damaging dry runs – especially as the seals are likely to sustain damage from an incorrect start-up. DESMI also performs installation and commissioning for automation, which encompasses frequency inverter filters, complete solutions for control panels, Human Machine Interfaces (HMI) and more. Confirming that the leading current coming from the frequency inverter won't damage the pump is the first part of an automation project check. From there, DESMI technicians work their way through the entire installation to identify potential performance issues related to piping or other parameters.

## **FINDING SOLUTIONS BEYOND THE PUMP**

When performing installation checks or conducting service calls, DESMI's engineers don't just examine the pump. They take the widest possible view of the pumping system and its surroundings, allowing them to consider every possibility and address the root cause. Could the problem be the pump's bearings?

Or might it be related to the surroundings? Is a different fly wheel required, perhaps? Is head/inlet pressure as expected?

With both preventative and condition-based service, sophisticated vibration analysis helps DESMI technicians discover the truth. So, too, does looking at the factors around or inside the pump. In the end, being able to accurately determine what's wrong, be it the pump, the piping before or after, or something else entirely, allows DESMI's field engineers to come up with a solution or adjust the pump's performance to suit the unique situation and perform to expectations.

## **A COMPLETE OVERVIEW**

DESMI's trained technicians are backed by a sophisticated system that registers all customer equipment – both DESMI-branded and competitor brands – and plans service visits and technical resources. The system decreases the potential for costly repair delays as technicians know if any parts have been installed that differ from the pump's original specifications and can ensure they bring all necessary parts. It also registers software versions, where relevant, and gives technicians access to all available data about the pumping system and its previous service history. After every service, DESMI's technicians produce a full report on the condition of the installation and any repairs that may soon be needed. And anything

that can immediately be done to increase pump efficiency is also communicated.

## **VALUE-ADD**

When a customer purchases a service package either from DESMI or from a competitor, DESMI may offer to hold critical spares in stock. Having these parts on hand at DESMI enables customers to minimise costly downtime by reducing repair time by as much as several weeks. As part of any pump package, DESMI can also offer training in simple maintenance, enabling in-house crew to help keep the pump system running smoothly and efficiently.

## **FASTER AND MORE REMOTE**

What does the future hold for DESMI's pump and automation field services? A key direction for the company is condition monitoring via remote surveillance. To do it, DESMI's R&D department is exploring an Internet of Things (IOT) approach that permits better monitoring of pump state and efficiency – and enables a service technician to be deployed at the optimal moment.

Today, already, customers can choose to set up remote access to their pump systems, enabling them or DESMI's own service engineers to monitor for faults and breakdowns from other locations. This capability is becoming more and more popular as pump installations grow in size and complexity – and when customers get a glimpse of the savings achievable in this way.





# DESMI UPGRADES TO FUTURE-PROOFED PUMP TESTING CAPABILITY

Danish-based manufacturer DESMI has supplied pumps for more than a century. When developing pumps, testing finished products for compliance with guaranteed values, or working with refurbished units, it is essential to run reliable, quality testing at a qualified pump testing facility. The capabilities required by such test beds tend to vary – from

straightforward, functional stations to complex test facilities that deliver high precision. DESMI's latest test bed, completed at the end of 2017 by DESMI Automation, works with extreme accuracy and a wider variety of testing scenarios – and it is enabling DESMI's customers to tap into a new, expanded set of testing certification services.

## **HEAVY INVESTMENT**

*"We've made a considerable investment to upgrade our existing test bed with complete, state-of-the-art technology,"* said André Jelstrup, Production Manager at DESMI. *"With eight different test bases, each equipped to handle pumps of varying sizes and types, we've now got far greater flexibility."*

Flexibility isn't the only advantage of the new facilities. Just as importantly, the new test bed can be both upgraded and expanded down the line. "This is where the real future-proofing comes in," Jelstrup concludes.

### IMPROVED TEST OUTPUT

DESMI's upgraded test bed technology is a vast improvement in performance testing. Once a pump is secured on its skid, an auto-cycle fills the pump cylinder with liquid, pushes the air out and automatically tests various points on a pre-determined pump curve. All the while, two viewing monitors provide a continuous and complete readout of the test results. Tolerances can also be accurately measured, providing a significantly larger data set than the previous system. This latter feature can be used to refine designs or catch problems at a much earlier point during testing.

Additionally, the new test bed enables technicians to experiment by up-scaling and down-scaling the power supply, simulating different media viscosities, or changing the number of frequency converters, for example. It also makes it easier to connect customer-provided frequency converters for testing pumps to reflect more accurate

operating conditions. The new test bed facility also contains an additional bay where noise and vibration tests can be performed, expanding DESMI's ability to provide certification services around these issues, as well.

### FACILITY OVERHAUL

The upgrade to the DESMI test bed took place by DESMI's own Automation team over nearly the entire 2017 calendar year. And André Jelstrup is certainly pleased with the result. "It was a great pleasure to execute our plan and be able to roll out the completed facility. The new facility features a modern, fully digitalized system with an entirely new power supply setup, and an expanded range of inputs and outputs. Our equipment standards have been raised, and we are delivering even more accurate readings to our customers," he states.

### REMOTE VIEWING

Looking for ways to move the company's test bed technology even further forward, the DESMI team has been hard at work to deliver remote viewing of pump testing - in real time. While many customers are able to visit the test bed in person, the option to view testing remotely will likely prove to be of huge benefit for customers around the globe.

"At some point in the future, this will all be live," says André Jelstrup. "One could literally sit in a café in a seaside village - watching and even perhaps asking the operator for particular parameters, to repeat a test, or even to run specific tests. This is the future of test bed technology and we are now positioned to deliver it."

### SUSTAINABILITY UPSIDE

The upgrade to a more advanced test bed has even helped the DESMI test bed team to deliver on the company's sustainability agenda by reducing the use of paper. "DESMI test bed staffers used to have to print out all test results in order to read them. Now all results are read, reviewed and archived digitally. We can also produce and distribute certification documentation electronically, faster and more efficiently. As things change, the technology must move with it. Our customers rely upon, and insist on us being able to deliver new capabilities," André Jelstrup concludes.



# REMOVING MARINE & AQUATIC DEBRIS FOR GOOD

Marine and aquatic debris is one of the most widespread solvable pollution problems, plaguing oceans, rivers and lakes around the globe. DESMI is applying its expert knowledge and lengthy track record in oil spill recovery to tackle the issue.

## GLOBAL-SCALE PROBLEMS

'Marine and aquatic debris or litter' refers to human-created waste deliberately or accidentally been released in a lake, sea, ocean or waterway. It's a growing global problem that impacts heavily on marine life as well as human health and life quality. In fact, as much as 10 percent of the world's plastic waste alone ends up in the ocean, much of it non-biodegradable. But there is hope at hand - and DESMI, a Danish-based, global company specialised in the development and manufacture of pump and oil spill response solutions, is looking to

strengthen both technologies and partnerships to tackle the problem.

## FROM WASTE TO ENERGY

Although the volume and spread of the marine and aquatic debris may seem overwhelming, it can be collected and used as an energy source, and DESMI's solutions contribute to making this increasingly viable. With the right equipment and know-how, and by establishing close partnerships with local governments, there is an immense opportunity to make a significant difference in the waste-to-energy value chain.

From clean-up operations in the jungles of South America to ocean waters, DESMI equipment provides effective, innovative solutions for the first step of the waste management chain. Specifically, the company develops and markets mobile and stationary clean-up units,

high-volume debris trawling devices, floating 'trash bins' and other clean-up equipment. Much of this equipment is inspired by decades of leading the field of oil spill recovery - an equally challenging problem in marine environments.

## CIRCULAR ECONOMY

While collecting and gathering debris and waste is a good start, invested resources may be futile if the debris is not disposed of properly. If, for example, debris is collected in a pile on shore and a storm follows, it may quickly return to the ecosystem. And badly managed landfill sites, for example, build up toxic substances and attract vermin, posing significant health risks. It is, therefore, essential to identify end-to-end solutions to effectively remove the problem as a threat to the environment, supporting a circular economy. And DESMI provides, therefore, both



## SUPPORTING GLOBAL GOALS

On 1 January 2016, the UN's 17 Sustainable Development Goals (SDGs) were officially launched. While the SDGs are not legally binding, governments are expected to take ownership and establish frameworks for the achievement of the 17 goals. With its marine and aquatic debris solutions, DESMI is particularly focused on SDGs 12 to 15.

**SDG 12 – Responsible Consumption and Production**  
Ensure sustainable consumption and production patterns

**SDG 13 – Climate Action**  
Take urgent action to combat climate change and its impacts

**SDG 14 – Life Below Water**  
Conserve and sustainably use the oceans, seas and marine resources

**SDG 15 – Life on Land**  
Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss





## DESMI TRASH TRAP

Floating debris, municipal trash and plastic articles are an ongoing blemish on the environment. Much of this material finds its way into streams, rivers, canals, and ultimately into our oceans. A simple solution to this is the DESMI TRASH TRAP. In conjunction with our superior fence containment booms, the floating unit serves to contain much of the floating surface debris while allowing smaller particles and most naturally occurring materials suspended in the watercolumn to pass through. The unit floats on the surface of the water, rising and falling with tides and runoff. The containment guide booms can be positioned to deflect materials from literally any part of the stream. Maintenance consists of periodically lifting the debris basket out of the trap and dumping of its content for sorting or disposal.



know-how and technologies for one vital part of this circle.

According to Henrik Knudsen, CEO at DESMI's Ro-Clean subsidiary, establishing local partnerships is key to addressing collection, transportation, and recycling or the safe disposal of non-recyclable waste: *"Based on expertise and capabilities gained in the oil spill industry over many years, we saw an opportunity to contribute to solving this global problem, which is now at the top of UN, regional and local government agendas."*

## SUSTAINABLE GOALS

Perhaps the most prominent of the agendas he refers to is the 17 UN Sustainable Development Goals (SDGs). By working to remove marine and aquatic debris as a problem, DESMI is primarily contributing to the achievement of goals 12 to 15 (See the SDG fact box). Others of the goals are indirectly impacted, too, such as the aims of creating sustainable cities and communities, and providing affordable and clean energy.

Additionally, local communities working with DESMI will also gain decent work and economic growth by creating further local collection

and disposal jobs, many of which only require basic training. In fact, countries such as Indonesia and Malaysia already have a so-called "collector workforce" active, for example, in the collection of plastic bottles. Building and structuring the process of collection, transportation and disposal of the waste would expand this employment system. And it would create the need for additional academic and administrative resources, too.

Another important UN SDG addressed by DESMI's solutions promotes good health and well-being: known as SDG 3. One aspect of this is the viruses carried by mosquitos, including the Zika virus, dengue and yellow fever, all of which have been described as public health catastrophes. Infectious mosquitoes tend to live in waste such as tires, cans and plastic containers – unnatural environments created by humans.

Removing and disposing of such waste from the environment would, therefore, benefit the health and well-being of entire communities, and potentially wipe out serious health risks.

## CHALLENGING ENVIRONMENTS

Every environment is different, which can be a serious challenge when it comes to waste removal, as Henrik Knudsen emphasises: *"No two riverbeds are the same, for example. Some have a rock bottom, some have a sandy bottom, and sometimes you're in the middle of a swamp."* Each environment demands something slightly – or completely – different of equipment, operators and partnerships. At times, it is possible to use heavy equipment. Other times, where roads or accessibility can't support heavier machines, the use of flotation aids is more appropriate. Here, DESMI's expertise in identifying project needs and subsequently providing solutions to suit available budgets comes in useful, informed by the company's work with similar projects in remote parts of the world.

## MOVING FORWARD

With a comprehensive understanding of marine and aquatic environments, and the ability to provide a range of proven equipment, DESMI is well positioned to partner with local governments and businesses to determine the best possible solution. And the company is actively encouraging potential project owners and participants begin dialogue for a better future together.

# NEW EFFICIENCIES FOR SINGLE-VESSEL OIL SPILL RECOVERY

DESMI has introduced a new oil spill recovery product, RO-Kite, combining it with a DESMI SpeedSweep boom and RO-Skim skimmer to make cleaning up spills with just one vessel far easier, faster and more cost-effective.

## ONE SYSTEM DOES IT ALL

Every now and then, something comes along that makes a real difference to the way an industry works. The latest addition to the portfolio of oil spill recovery solutions from market leader DESMI is one such product.

Christened “DESMI RO-Kite”, the new aquatic device, which is designed to replace the functions of a second vessel, has been eagerly anticipated by DESMI’s customers. In fact, RO-Kite can turn single-vessel oil spill recovery from a last-resort, difficult-to-handle alternative into the first choice for a wide range of spill situations. And, together with other products in DESMI’s oil spill recovery portfolio, it boasts a long list of advantages to back such a claim.

## SINGLE-VESSEL BLUES

It doesn’t take a genius to work out that deploying and coordinating two vessels to operate an oil spill recovery boom between them is more expensive and logistically challenging than one. However, although single-vessel solutions have been in existence for some years, their use has been severely limited by a number of problems – mostly associated with the size, weight and rigidity of the equipment, as well as the comparatively slow speed at which it can be operated. DESMI’s new solution is different. By combining RO-Kite with two other, well-proven products, DESMI SpeedSweep boom and DESMI RO-Skim, the company has managed to create a system that makes cleaning up oil spills using a single vessel far easier, faster and more cost-effective.

*“In decades of working in this field, we’ve seen a variety of ways to operate with a single vessel system,”* says Henrik Jensen, Sales and Project Manager for DESMI Ro-Clean A/S. *“Many have used a jib and a float attached to the stern and*

*aft to keep the sweep in shape. But that’s too complicated. Today, the best approach is to use an aquatic device. The few devices already on the market, however, have presented their own set of difficulties.”*

DESMI’s RO-Kite promises to change things for the better – and it is a key component of the company’s single-vessel system. Deployed behind the recovery boom, RO-Kite helps to keep the shape of the sweep, while the RO-Skim skimmer located at the apex removes the contained oil from the apex. At the same time, the heavy-duty, rubber SpeedSweep boom with its multiple permeable barriers boosts the speed at which oil can be recovered from the industry standard of 0.7 knots to as much as 3 knots. That’s a lift of more than 350 percent – and it’s clear evidence that, properly equipped, one vessel can easily perform the work of two.

## COST AND HANDLING BENEFITS

Of course, experienced recovery vessel operators know that operating at higher speeds is just one side of the equation. Ease of equipment



handling is every bit as important. The new combined system provides significant cost-savings for oil spill response contractors. Unlike other systems, which include a number of loosely connected devices in the apex, the DESMI solution guarantees easier maintenance, as well as fewer possible problems. And thanks to the light weight of the RO-Kite, the entire system can be launched without the need for a deck crane. It's clear that a lot of thought has gone into the handling of DESMI's single-vessel solution. For example, where conventional booms incorporate a rigid, usually foam-filled flotation device, the RO-Kite is buoyed by air. To inflate the RO-Kite, crew can use the same air pump as used to deploy the SpeedSweep's boom, further easing handling, transport and storage.

The list of advantages stacks up to a far safer solution, too, which is sure to please the Health and Safety departments of both contractors and their oil company clients. With fewer devices on deck, the potential for accidents is reduced – and the absence of a crane is perhaps the most compelling of these benefits. But it's not just the crew that can operate under safer conditions. With rubber replacing rigid components as much as possible throughout the solution, there are fewer parts that could damage the hull of the vessel during operation. And that alone delivers new cost savings.

### SINGLE SUPPLIER INTERFACE

*"We've managed to create a complete, single-vessel oil spill recovery system using DESMI products alone,"* says Henrik Jensen. *"The skimmer is made from our material, we use a DESMI pump, even the self-floating umbilical hose from the skimmer to the vessel is a DESMI product."* The combination is proving to be a powerful argument for equipment buyers, partly

because most oil spill recovery contractors prefer not to deal with multiple suppliers for components or technical support when disaster strikes and fast problem-solving becomes crucial.

### SELF-FLOATING HOSE SLEEVE

The hose Henrik Jensen mentions is itself a noteworthy innovation. Called the ZUH (Zipper Umbilical Hose), it resembles a large, sleek anaconda – albeit one that can easily be opened or closed with a bright yellow zipper!

Snugly housed within this self-floating sleeve are the individual hoses required for transporting oil from the skimmer to the vessel's holding tank. Its key advantage, then, is that it collects multiple hoses cleanly and simply, while removing the need to attach multiple flotation devices to each hose. Moreover, the oil skimmer fitted at the end of the ZUH can be operated both during winding off and while on the reel.

### WORTH THE INVESTMENT

According to Henrik Jensen, the oil spill recovery market can expect to quickly gain advantages from the combined DESMI products:

*"The DESMI RO-Kite and our single-vessel system really stand out. By turning single-vessel systems into a smart choice instead of a poor alternative, we can make an extremely worthwhile difference to how much oil can be recovered – in a shorter timeframe, with fewer resources and greater safety."*

At first, DESMI is offering its single-vessel system – and comprehensive hands-on training – for small to medium-sized vessels operating in open coastal waters. And an offshore model that can be used by larger vessels is currently in development.



### DESMI MAINTAIN A PATENT ON THE RO-KITE DESIGN. SEVERAL UNIQUE FEATURES OF THE DESIGN ARE MENTIONED HERE:

- 'Soft' design that prevents risk of personal injuries by handling
- Easy dismantling and packing for compact storage.
- Robust and non-vulnerable design that allows collision with ship structure
- Hydrodynamic principles that minimize the required dimensions
- Choice of long term proven materials for oil boom design



# DESMI MAKING IN-ROADS IN FRENCH BITUMEN MARKET

When a large road builder needs to build a bitumen plant or wins a road-building project, it typically asks a complete, turnkey bitumen plant. And in France, as with many other regions of the world, such manufacturers are increasingly turning to Danish-based pump manufacturer DESMI.

Bitumen presents heavy challenges for industrial pumps – the most pressing of which is the need to minimise or entirely eliminate leaking. *“Bitumen is a tough substance to transfer,”* says Nicolas Maunier, Sales Engineer for Danish-based pump manufacturer DESMI. *“When the pump stops and the temperature falls, it hardens quickly. So any leaks will create an unsightly mess that is very difficult to clean up.”* DESMI’s wide range of heavy-duty ROTAN® asphalt/bitumen and fuel pumps and accessory equipment ensures that bitumen can be quickly and safely transferred – and the pumps comprise only two moving parts for more reliable operation and easier maintenance.

The company has achieved particular success with its pumping systems for the tank terminals used to store bitumen, typically by large oil companies. Its many-year track record, however, spans stationary bitumen tanks that ensure continuity of supply for roading projects, hot-mix or cold-mix plants where small stones are mixed in with the bitumen, and emulsion and roofing plants. For special applications such as the manufacturing of cathodes in aluminium plants, DESMI offers a magnetically coupled pump for ultimate protection against leakage, and maintenance-free operation.

## COMING TO FRANCE

DESMI’s French subsidiary opened in 2011, aiming to capture more of the

local bitumen market where, in fact, the company’s pumps had already been distributed for many years. *“When we established the subsidiary, our main competitor had a solid position in the marketplace,”* says Nicolas. *“Right from the beginning, however, our bitumen pumps won a prestigious contract with ERMONT, the main OEM manufacturer in France. Since 2012, in fact, we’ve had a framework agreement in place to supply the company with around 50 pumps a year for a variety of applications.”*

## TRACK RECORD COUNTS

Despite the geographical size of the country, the French bitumen market is a tight-knit community where everyone knows everyone. And this

is one of the principle reasons behind DESMI's rapid road to success since setting up the local presence. "Every project you do well opens a door to the next one," says Nicolas. "That also means, of course, that you are only as good as your last project! Fortunately, we've managed to get the formula right many times by now, so our reputation has become one of our best selling points!"

DESMI's French team is excited about the future for the company's bitumen business – not just in the local marketplace, but in more distant markets such as Africa, too. Africa is in desperate need of new roads, bringing with it the need to build local bitumen plants that can provide a steady supply flow. DESMI France also covers the company's activities in Northern Africa, where a distributor provides local service, backed by DESMI's expertise out of France or other locations around the world.

### HOT PRODUCTS

"We have very good solutions for maintaining temperature in pumping systems – using thermal oil, hot water or electricity," says Nicolas. "Today, most customers want electrical heating and 80 percent of our sales are made in this way to achieve a clean and cost-effective installation. In Africa, however, they generally need to heat pumps with thermal oil – and we can easily adapt to that need."

Electrical heating deploys a temperature probe, mounted in a hole drilled in the idler pin of the pump. As the idler pin is placed in the middle of the pump and its liquid contents, heating is concentrated where it is best used. Road tankers and plants benefit most from this method of heating, easily connecting to an existing power supply. Thermal heating is made possible by adding heating jackets to the pump's front and rear covers.

### GOOD CONNECTIONS

Most issues with DESMI's pumping systems are relatively small and easy to solve, but the company's service tradition still demands its staff to drop everything and focus on the customer until issues are resolved to the customer's satisfaction. And according to Nicolas, having international access to specialised pump expertise is particularly useful for DESMI's ability to win new contracts.

"Working in Algeria, for example, on a project for a new roofing plant, we were able to provide references from many projects we've conducted in Sweden and Norway stretching back more than a decade. Our subsidiaries in those countries sent a list of customer contacts that the Algerian's company's director was very welcome to contact. And that provided a strong comfort factor."

Less common types of projects, such as those where positive displacement pumps are involved, make the most of such specialist assistance. Here again, DESMI's French subsidiary can team up with other parts of the company to offer a specific solution for each problem. It's an approach that adds considerable strength to the quality of pre- and after-sales service provided.

### ALL-AROUND CONFIDENCE

Nicolas believes customer relationships are largely driven by the quality of the supplier's employees. "If they're highly skilled and service-minded, customers can quickly get comfortable. You have to really know what is important for them, and if you don't have specific know-how about their challenges and operating models, if you don't talk the same language, you're unlikely to win their confidence."

For many of DESMI's customers in France, building those relationships begins with a visit to the company's manufacturing plant and headquarters in northern Denmark. Some have also been invited to the Chinese facility. It's a chance to meet many more of the people involved with the customer's solution – and to put a face on potential contacts who may help to design, build or support future solutions, too.



### HD (HEAVY DUTY) CAST IRON PUMPS

(Flow rates up to 250 m<sup>3</sup>/h [US number])

The HD PUMPS are typically used for the asphalt and bitumen industry. The modular design of the pump together with the large number of options makes it possible for the customer to design a pump solution fitted to his needs.


### ROTAN® DESIGN PARAMETERS

Capacity Range: Up to 250 m<sup>3</sup>/h / 750 US gpm

Pressure Range: Up to 16 bar / 232 psi

Viscosity Range: Up to 250,000 cSt

Temperature: Up to 250°C / 482°F



# DESMI PUMPS MORE THAN A MATCH FOR POWER PLANT RESIDUES

Removing toxic residues from power plant flue gases is as tough on equipment as it sounds. Known for having the toughest pumps in the business, DESMI is looking to take on more of the power plant challenge.

## POWERING FORWARD

The world is gradually moving away from traditional energy production such as coal and gas and, as a result of the drive towards sustainability in recent years, waste-to-energy and biomass power plants have become a popular production method. Like their fossil-fuel colleagues, however, these plants must remove or 'scrub' potentially hazardous pollutants from the flue stage of the process.

The system requirements for flue gas cleaning depend on a long list of factors. Gas cleaning of complex flue gases can be realized in many ways, either in a few or several steps. Each plant is more or less unique, and must be evaluated separately to achieve an optimal solution.

Gas-cleaning systems can typically be categorised as solutions to remove:

- Particles or dust collection without the need for pumps.
- The water-soluble gases SO<sub>2</sub>, HCl, HF and NH<sub>3</sub>, performed using either wet or dry gas cleaning.
- NO<sub>x</sub> (mainly NO)
- Highly toxic substances such as dioxin and mercury (Hg)

In all cases, where there are highly-corrosive chemicals flowing through pumps 24 hours a day, a production facility is likely to face costly repercussions in terms of risk, productivity and repair if the machinery should fail. Christian Busch, Danish-based industrial pump manufacturer DESMI's sales manager for the utility sector across Europe, the Middle East and Africa, is very aware of the impact on machinery: *"The 'scrubbers' are located after the boilers.*

*"Continued exposure to this combination of factors can rapidly have a detrimental effect on the pump machinery if it's not specified and manufactured appropriately. We've spent more than two decades working with a very similar set of factors in pump supply to the maritime sector, and it's partly from this that we got the inspiration to apply our technologies to land-based flue gas scrubbing, too."*

### COMING ASHORE

DESMI's expertise in supplying corrosion-resistant pumps to the shipping industry has received extra focus in recent times. Particularly following the introduction of more stringent regulations governing sulphur emissions. Now, the company is increasingly the subject of attention in the utilities sector, too, for the supply of efficient, reliable and durable pumps in the various stages of the wet scrubbing process.

*"We have built our reputation on several aspects that are equally as important in the power generation industry as they are in the maritime world,"* says Christian Busch. *"It's the same formula, you might say, designing pumps fit for purpose and beyond, with reliability, efficiency, durability, ease of fitting and*

*maintenance, and cost effectiveness as the key success factors."*

Over the past five years, DESMI has installed high-durability systems in power plants in its home market, and is now looking to extend its utility sales beyond the Nordic region with Christian Busch at the helm. And there is clearly a need in the marketplace: "We're focused on getting to know the big companies that specialise in making custom-built systems for the various power plants - and we're discovering that they are just as keen to learn more about us."

### HARD-EARNED REPUTATION

Quality of all components is obviously a key factor for both utility and manufacturer, especially when dealing with the processing and neutralisation of dangerously toxic chemicals. The pump units need to be particularly resilient to corrosion, they must be able to withstand continued load and usage over long periods, and they must ensure minimum down-time. The ramifications of taking a plant offline for essential pump maintenance due to malfunction or wear and tear can be immense - and commercially unacceptable. For these reasons, ultra-high quality pumps are an

absolute must in such application areas, and DESMI's centrifugal pumps in super-duplex stainless steel are well-suited to the task. DESMI believes that the versatility, strength and support services of its product line makes it an ideal choice for turnkey and sub-system companies delivering to both large- and small-scale plant projects.

As with all DESMI pumps at this level, service including replacement of bearings and mechanical shaft seal can be carried out without removing motor and piping, saving both time and money for the power plant, enabling utility staff to carry out service tasks themselves, and boosting uptime statistics. Christian is confident of DESMI's ability to maintain customer satisfaction with its solutions: *"Often, utilities require an extended warranty period, corrosion guarantees and fast customer service that can match such an aggressive, high-stakes environment. And that's something we can definitely provide."* With more than 100 years of heavy-duty pump development and manufacturing for a broad range of demanding applications, DESMI is likely to have a lasting impact on power generation infrastructure for decades to come.



### NSL STAINLESS STEEL

#### CAPACITY RANGE:

30 - 1200 m<sup>3</sup>/h at 50 Hz  
30 - 1400 m<sup>3</sup>/h at 60 Hz

#### PRESSURE RANGE:

15 - 60 mLC at 50 Hz  
15 - 80 mLC at 60 Hz

#### TEMPERATURE RANGE:

With standard mech. shaft seal up to 80 °C (170 °F)  
With special mech. shaft seal up to 140 °C (284 °F)



# HIGH-QUALITY PUMPS HELP FISH FARMS HANDLE GROWTH

Pumping systems manufacturer DESMI's Peter Laursen offers advice to farmed-fish processing plants looking to invest in high-reliability, scalable pumps to meet production pressures. With fewer and fewer fish in our seas, fish farming has grown to become an enormous industry worldwide – with billions of dollars in revenue and continued growth forecast for decades to come.

Like any industry of this size and growth rate, fish farming requires a reliable, high-throughput production apparatus to keep up with market demands. And, while they may not be the first thing most people associate with fish farming, the pumping systems used by today's leading farms have become a business-critical factor in keeping costs down and production capacity up.

## **A GROWING INDUSTRY**

Fish farming's share of total fish consumption has increased from around five percent in 2007 to approximately 50 percent today. By 2030, according to a study jointly conducted in 2014 by the World Bank, the FAO and the IFPRI, heavy demand may see the industry serving two-thirds of worldwide needs. A variety of factors are driving this growth, which has seen the average

person's intake of fish double since the 1960s. Among these are the widely accepted belief in the need for omega 3 fatty acids, expanding consumer wallets, and highly modernised production systems.

For the world, fish farming is a necessary development, helping to compensate for the continued depletion of wild fish reserves. At the same time, responsibly conducted fish farming is generally kinder to the environment, with 1 kg of carp, for example, requiring around 15 times less food to bring to market than the equivalent amount of beef. In global terms, Asia leads the industry. And with good reason. China, for example, will consume as much as 40 percent of annual food fish production by 2030, and is investing heavily to enable fish farming as a food source for its immense and growing population.

## **SCANDINAVIAN TRADITION**

Scandinavia is no stranger to fish farming, either. In the Faroe Islands alone, the industry accounts for around 50 percent of BNP. This far-flung archipelago, with its unspoiled nature and waterfalls, has a long tradition of fishing, and has made the transition to fish

farming in leaps and bounds. Peter Laursen, Area Sales Manager for Denmark-based industrial pumping systems manufacturer DESMI A/S, is a frequent visitor to the Islands. He is very familiar with best practice farming methods and, in particular, with the role his company's pumps play in keeping production up and running.

*"Last week, I visited a major fish farming company in the Faroe Islands that's building a huge facility for breeding and slaughtering salmon using the fjords, and another facility for producing feed," he says. "Despite my years in this industry, I'm still impressed by the scale of things, and I'm very interested in the difference that can be made by using today's technologies to modernise fish farming and processing."*

## **FISH UNDER PRESSURE**

In a typical, large-scale fish farm factory, daily loads of live salmon arrive by large 'well boats' before being pressed into the facility with the aid of giant pumps. For the Faroe Islands producer, DESMI is providing pumping systems to provide the new facility with seawater, helping these vessels to offload by creating a flow of water in large onboard tanks that is then released with the



fish when a valve is opened to the plant. *"The job doesn't stop there, of course,"* Peter Laursen continues. *"With regulatory authorities careful of threats to the environment, well boats aren't allowed to release water before it has been treated with UV or similar techniques to remove or incapacitate potentially invasive organisms."* DESMI's systems are also present in the processing plant itself, where large quantities of seawater need to be moved around as an indispensable part of production.

### ADVICE FOR PURCHASERS

For those investing in up-to-date pumping systems for their vessels and processing plants, Peter Laursen has good advice to share. *"Typically, you'll need huge pumping capacities – as much as 1,000 cubic metres per hour at quite low pressure. The machinery needs to be able to withstand the wearing effects of sea water, so we use bronze alloy, which is the same robust material as used for seawater cooling on commercial vessels. Our marine pumps are all equipped with heavy ball bearings, too, rather than the sleeves and other mechanical parts used in many other applications."*

Peter Laursen goes on to explain that, while investments in such systems are significant, the costs of cutting corners can be far worse. *"Reliability is a must, because a low-quality pump can stop the process entirely, quickly resulting in tons of rotting fish and heavy daily losses. It's a major business risk that simply has to be dealt with."* With so much at stake, producers take other precautions, too, such as standby pumps that are always ready to take

over if the worst should happen. In Peter Laursen's opinion, however, the best line of defence is always to ensure the primary systems are as reliable as possible.

With fish products already a high-priced consumer item, Peter Laursen advises producers to take advantage of low-energy systems, too – an area where DESMI has carved out a particular niche for itself and its customers. Low energy consumption is assisted by frequency converters that enable pumps to increase or decrease the power generated by their electrical motors depending on the current processing load.

### THE CUSTOMER IS KING

High on Peter's list of recommendations, too, is something that a quick glance through a manufacturer's catalogue won't usually reveal: flexibility. *"For the plant we're talking about here, the vertical pumps that are usually used turned out to be too tall for the factory pump room, due to the customer having to lower the building's ceiling for other reasons. The problem showed up quite late in the delivery schedule, but due to our decades of experience with pumps of all types – and a comparatively flat decision-making structure within DESMI, we were able to move from idea to final design in a remarkably short time. Everyone from design engineers to management got behind the project, keeping bureaucracy at bay and staying tightly focused on the customer's needs and priorities."*

Flexibility has long been a key competitive advantage for DESMI, whose products are based on a

philosophy that, while around 80 percent of a pump type may be standardised, there is still plenty of room to add specific features for a particular application or customer.

### RELIABLE REPUTATION

Peter Laursen's role as Area Sales Manager for DESMI's fish farming pump systems is helped along by a solid reputation built up by the company over many years. *"We've been working with fish farming pumps for more than 10 years. But many people in the industry know us from other applications and ask to have our pumps for their fish farming facilities, too. So our reputation for good, reliable products, good service and ease of access to spare parts in the marine sector has carried over to this industry, too."*

DESMI is expecting strong growth for the future. In China, for example, the largest fish farming country in the world, efficient production of food is a key priority. And fish farming's high efficiency and sustainability makes it a highly attractive focus area. *"We will be more active in Asia going forward,"* says Peter Laursen. *"Asian fish farming is done differently, but all such plants require pumps to add new water to the plant or to circulate water to maintain a certain temperature, so there is plenty of room for us to grow. And, while a new plant may not be built every day, well vessels are constantly being launched from the world's shipyards – and each one is potentially a good home for a DESMI pumping solution."*



# MAGNETICALLY POWERED PUMPS SEAL THE DEAL

For companies pumping dangerous or expensive chemicals, leaks can endanger both personnel and the bottom line. Hermetically sealed, magnetically powered pumps are the state-of-the-play answer.

The list of potentially dangerous or simply-too-expensive-to-lose substances being pumped from one part of an industrial process to another somewhere in the world is long. Take isocyanates, for example. They're the raw materials that make up all polyurethane products. Despite their relatively low acute toxicities, isocyanates can present harmful effects to the eyes, skin and respiratory tract (methyl isocyanate, for example, was at the centre of the 1984 Bhopal disaster).

Of course, few manufacturing or processing plants pump such substances on a truly large scale. But even the smallest of plants need to be sure they aren't exposing their

workers or surroundings to danger when working with solvents, printing ink, resin, pitch or hazardous organic liquids. And they need to guard their business economics against leaking non-hazardous, but pricey raw materials such as linseed oil, corn syrup or soyabean oil. In such situations, the best and safest type of pump to use is a hermetically sealed, magnetically powered device based on the ROTAN® principle.

## **PATENTED NO-LEAK PRINCIPLE**

The basic concept of a ROTAN® pump differs from those of conventional pumps in that everything is completely and entirely sealed inside. Dirt or other contaminants

have no way of entering the pump, and nothing within the pump can leak out.

The secret to achieving a fully enclosed design lies in the fact that, in contrast to conventional pumping systems, no holes or channels are required to bring electrical power into the pump. Instead, the medium being pumped circulates around a magnetic coupling carrying exactly the right number of magnets required for power to be transmitted from outside the device. Simple 'centrifugal pump'-shaped channels in the shaft and rotor ensure continual replacement of the liquid heated by friction and re-circulation in the coupling. At the same time,



## **KEY FEATURES AND BENEFITS FOR ROTAN® ED**

- Reversible direction of flow with double acting relief valve option available.
- Coupled direct to NEMA or IEC motor for speed up to 1750 rpm
- Directed coupled gearbox with NEMA or IEC electric motor eliminating alignment issues
- Adjustable rotor end clearance without opening the system to the atmosphere
- Torque capabilities in excess of 800 ft-lb
- Flow rates max. 90 m<sup>3</sup>/h with differential pressure up to max. 16 bar.
- Iron, Steel and Stainless Steel construction
- Tungsten Carbide abrasive wear materials are available for abrasive duty applications

this ensures efficient lubrication as well as heat transfer from the slide bearings. The pump can be easily reversed, too, causing its medium to flow in the opposite direction simply by reversing the motor's direction. Finally, unlike centrifugal pumps, a ROTAN® pump offers gentle liquid-handling and a high priming vacuum, along with the ability to pump highly viscous liquids. The unique, patented ROTAN® principle is generally recognized as the most advanced internal gear pump design available anywhere today. And it's far and away the best solution for safely moving hazardous or costly substances. As an added bonus, there's very little residue build-up, so far less cleaning is required.

### **SAFETY IN PRODUCT AND SUPPLIER**

While many pump manufacturers aspire to offering ROTAN®-style technology, DESMI A/S currently rules the market with its ROTAN® ED pump. The Denmark-based company has produced these pumps as part of its extensive product portfolio for over 20 years, building an impressive technological lead. "By now, we've worked with this pump design in a tremendous variety of industrial applications," says Peter Tipsmark, DESMI's Industry Segment Director. "And that's every bit as important to prospective buyers as the quality and functionality of the pumps themselves. At the end of the day, it's

*this depth of experience that ensures high safety levels as well as maximum returns on the investment."*

### **ALL THE OPTIONS**

DESMI seems to have thought of all the angles for its top-of-the-line pumps. For substances that need to be cooled, an integral pump eliminates the need for external cooling. And for those that like it hot, optional external heating jackets can be added, enveloping the pump's front cover and magnetic coupling housing. There's a choice of materials, too. Slide bearing materials, for example, vary from cast iron, bronze, carbon to tungsten carbide. The magnets themselves are made of neodymium-iron-boron, and optional samarium cobalt permanent magnets allow operating temperatures as high as 250o Celsius. And both internal and external canister protection is offered.

### **INCREASING DEMAND**

Market-leading companies such as BASF, Huntsman and Bayer have long been using ROTAN® technology from DESMI, but they're not the only ones to see its advantages. And in many cases, companies approach DESMI to replace existing double-seal solutions that can't live up to the task. "There's never been a better time for ROTAN®-style pumps," says Peter Tipsmark. "We're installing them, for example, in increasing numbers to Asian markets, as well

*as emerging markets on the African continent. In China, for example, ROTAN® technology has quickly become accepted not just for large enterprises, but for smaller ones, too. Basically, the need for optimum safety is the same no matter where you operate."*

In China, Guangzho Strong Chemical Co., Ltd, a leading domestic producer of automotive refinish coating material, is a recent customer for DESMI's pumps. Facing increasing demand for its product, the company expanded production capacity with a new factory in March 2014. After careful evaluation of the ROTAN® ED pump's technical advantages, its total lifecycle, and the safety track record DESMI was able to document, Guangzho joined a fast-growing list of ROTAN® technology adopters in the region.

"Guangzho were interested in a complete pump solution that could take into account liquid properties and the piping layout," explains Peter Tipsmark. "So we held numerous meetings with both the company and its engineering supplier to understand more about their needs. It's the only way to arrive at a great solution - and the results speak for themselves." DESMI is continuing to upgrade its ROTAN® pump line-up, following growing market demand, and keeping businesses and people safe with this well-proven technology.





# DESMI LIFTS GREEN SHIP BUSINESS CASE

Maritime pumping solution manufacturer DESMI's energy-optimisation approach generates positive cashflow for shipowners struggling to comply with new regulations.

## NEW RULES CALL FOR FRESH APPROACH

It's hardly news that the shipping industry is mobilising to meet the demands of wave after wave of new environmental regulations. From the IMO's ballast water management legislation to EEDI (the Energy Efficiency Design Index for new ships) and SEEMP (Ship Energy Efficiency Management Plan), shipowners need to be ready to drastically cut energy consumption and emissions.

Vessel and equipment producers have, of course, risen to the challenge, devising tools and strategies from new, energy-saving hull paints to higher-capacity container ships. But is there a way to make the necessary investments to satisfy regulations and create savings, too?

Pump solution manufacturer DESMI, drawing upon its long track record in the development and manufacture of pump solutions for marine, industry, oil spill, defence and energy industries, has some of the answers to that question.

The Danish-based company is focused on reducing energy consumed by onboard equipment in and around engine rooms. With solutions covering everything from seawater pumps to ventilation systems, the company has found plenty of ways to cut consumption. Its solutions have surprisingly short payback times – but often, the most compelling aspect is the annual savings that follow. And the company is putting forward solid customer data to prove its claims.

## OPTIMISING ONBOARD ENERGY

Auxiliary systems in engine rooms and their pump components are designed to cope with the worst possible foreseeable conditions. In reality, however, such systems can be made to run at operating levels that better correspond to the vessel's actual load at any particular time. And according to DESMI's Michael Lassen, Segment Director for Marine & Offshore, this is an excellent strategy for shipowners keen to comply with the new regulations.

*"A lot of onboard machinery constantly operates as though the vessel is under 100 percent load and having to cope with air temperatures of up to 50 degrees Celsius and sea water temperatures up to 32 degree Celsius. But those conditions reflect*



*perhaps only one percent of a ship's operating lifetime. The rest of the time, you might say, it's like running the heating in your house at full blast with the windows wide open. Making control systems that closely match energy consumption to actual requirements is something we've been focusing on for a number of years."*

### **SAVING ON PUMPING POWER**

As a starting point, DESMI's own seawater pumps are designed to pull maximum efficiency out of today's pumping technologies. But the company doesn't stop there, extending its energy efficiency range to optimisation solutions such as DESMI OptiSave™ which can, for example, save up to 80 percent of power consumption for a vessel's seawater pumping tasks. "We have

*delivered many of these solutions by now," says Michael Lassen. "And all have been shown to provide 60-80 percent savings for ships travelling, for example, between ports in Europe and Asia."*

Seawater pumping systems aren't the only pumps in a vessel's engine room. Other systems cool down steam that hasn't been used in steam turbines, for example, condensing vapour into liquid again before re-feeding it into the boiler. When there is little steam to be returned to the condenser, less seawater is required, enabling the speed of the pump to be reduced to a necessary minimum. Another area for potential savings arises, for example, when the vessel is sailing at lower speeds.

Normally, 3-4 fans push compressed air into the engine room to boost combustion effect. These systems usually run at full speed, regardless of load, even when less air is required. DESMI's OptiSave™ controls these components, too, reducing their speed to correspond to real needs. DESMI also applies similar thinking to the sulphur-removing scrubber systems required for vessels operating in Nordic SECA (Sulphur Emission Control Area) zones. Such systems use a 'rain shower' of water to clean the gas produced by heavy fuel oil, removing sulphur and other undesirables before releasing the exhaust into the atmosphere. Highly resistant, stainless-steel pumps provide the seawater for this process and, with the scrubber system placed at the highest point on the vessel, they typically consume considerable energy.

## ALL-IN-ONE OPTIMISATION

A key advantage of DESMI's Optisave™ is the ability to install just one piece of extra onboard equipment to control the energy for seawater, condenser and engine room fans. With just one cabinet, ship designers can easily incorporate new energy savings without significantly adding to the deckspace headaches already caused by the need to install additional systems for environmental compliance.

## POSITIVE CASH FLOW

So why is all this onboard energy saving a good deal for the already cramped budgets of today's shipowners? Michael Lassen claims that, apart from the benefits of sheer regulatory compliance and continued access to profitable sailing routes, the potential savings of onboard energy control systems have proven to be quite spectacular. *"While it may be tempting to let tight newbuild budgets dominate onboard equipment specifications, shipowners can do themselves a favour by focusing on the medium and longer term numbers behind high-end pumps combined with energy-optimising systems like OptiSave™."*

*"Fuel is the most expensive component of the maritime business model. So once such a system is installed, it's quick to prove its*

*worth. And with the initial investment recouped, the shipowner actually earns money every single year until the vessel is decommissioned, sold or scrapped."* DESMI has plenty of data to prove its claims. The company's off-the-shelf optimisation systems achieve a six-month payback time for newbuildings, which is blindingly fast for most engine room additions. Turnkey systems, such as those recently sold to one of the world's top three container lines, achieve their payback in around 18 months. After that period, savings of EUR 35,000 annually per vessel are achieved. These particular systems were retrofitted on vessels in operation, and DESMI was responsible for project handling, installation and commissioning, all for a fixed price.

*"With annual gains like these, even the current oil price slide isn't affecting the general business case – or our sales of new systems. And everybody knows that the oil price will not stay this low forever,"* says Michael Lassen.

## BALANCING THE BOOKS

Energy-optimising systems also help to make sure shipowner business models don't suffer from the additional fuel consumption associated with ballast water treatment systems and other new, mandatory equipment. Here, optimisation power-savings can

balance the fuel equation to maintain vessel profitability.

” So even a five percent improvement can make a very worthwhile difference over time.“

The strongest argument for DESMI's green ship solutions is to be found in the data it has made publicly available at [www.optisave.info](http://www.optisave.info) - and in the specific calculations its energy experts can carry out for interested shipowners and their vessel designers. But according to Michael Lassen, there's still more work that can be done to squeeze further savings out of today's auxiliary systems on board vessels. *"The new energy efficiency index regulations are pushing us to develop even higher-efficiency pumps. We are still trying to lift up from 80 to 85 percent efficiency, challenging ourselves to do better because we know that these pumps run around the clock – so even a five percent improvement can make a very worthwhile difference over time."*



## PUMPS-FOR-FREE

Among DESMI's innovative approaches is 'Pumps-for-free': a cash flow-neutral investment concept for energy-saving solutions. It's a unique financing package, enabling shipowners to energy-optimize their vessels while repaying the investment through savings, typically in 14 to 18 months. The financing schedule is linked to the ROI/payback period, with quarterly payments.

DESMI offers a wide range of energy-saving products under the Pump-for-free concept, including:

- Replacement of older low-efficiency pumps with DESMI's highly energy-efficient pumps
- Retrofitting of Energy Savings Systems, also known as OptiSave™ for Sea Water Cooling pumps
- Retrofitting of Energy Savings Systems for fresh water cooling pumps
- Retrofitting of Energy Savings Systems for engine room fans

## CUSTOMIZED SOLUTIONS

*"Many of our customers prefer to take advantage of our turnkey solutions, where we take care of everything from pre-inspection to commissioning. Others like to install the solution themselves, turning to DESMI to carry out commissioning,"* says Michael Lassen.



# OIL SPILL TECHNOLOGIES HEAT UP

The concept of burning spilled or leaked oil on the sea's surface has been known for many years, offering an extremely effective way of reducing the spill by as much as 90 percent with minimal equipment. The method, commonly known as in-situ or controlled burning, takes advantage of the fact that oil can be ignited on water if the layer is at least 3 mm in thickness – even under Arctic conditions.

Compared with mechanical clean-up, chemical dispersants and natural assimilation, in-situ burning is highly effective, particularly in remote areas where the resulting smoke plume isn't so visible, or where it is difficult to deploy other types of clean-up equipment. Moreover, if properly employed, in-situ burning can result in the least detrimental overall impact on the environment. Although these advantages had long been recognized, the true potential

of in-situ burning could not be realized: the technology to do the job properly simply wasn't available, and regulatory acceptance was slow in coming.

## THE JOURNEY BEGINS

It wasn't until the late 1900s, in fact, that the first steps were taken in a journey that would finally see in-situ burning emerge as a mainstream option. Numerous research efforts aimed at finding the most efficient





burning means were conducted or commissioned by Shell Oil Company, Dome Petroleum and Exxon (now ExxonMobil), all with significant production in Canada and on the Alaska North Slope. These investments sparked a wave of new exploration into the development of durable, fire-resistant materials that could deliver on the promise of in-situ burning.

In 1982, a landmark Exxon Production Research project began to explore the technique of in-situ burning in earnest. At that point, the materials available for use were hopelessly inadequate. For a time, the best available practice was to take a conventional boom, wrap a multi-layer fabric “blanket” around it that could absorb as much seawater as possible, then light the oil and hope for the best. At some stage, however, a salt line or silt build-up could form in the material, allowing the fire to take hold and burn the fabric

away – making the solution time-consuming and expensive to use. Despite various attempts to remedy such problems, the “water-cooled” model faced significant challenges.

### A LACK OF STANDARDS

The lack of durable material wasn’t the only issue to be solved, however. The industry was also far from reaching agreement on appropriate standards for the equipment that would enable offerings from different manufacturers, for example, to be used seamlessly together. In short, much work needed to be done.

Peter Lane, Vice President at DESMI Inc., North America, takes up the story: *“Back then I worked for a company in the industrial fabric business called Albany International, Inc. We got a call from Exxon, asking us to come up with a material that was not water-cooled, but which could handle the heat of the burning oil, and be able to withstand all the*

*abuse a harsh environment like the Arctic has to offer.”*

### AN EARLY SOLUTION

By the late eighties, a company had come up with a hybrid fibreglass and wicking material wrapped in conventional fabric to create a redeployable, high-temperature oil containment boom. It worked comparatively well in tests, and large quantities were purchased for warehouse storage, mainly in Alaska. Due to the relative infrequency of spills or leaks, however, there were very few opportunities to properly evaluate the boom’s real-life performance. In the meantime, industry participants working within the 30,000-member standards organization ASTM International developed standards for conducting in situ burns, for assessing expected lifetimes in simulated environments, and for developing products. The United States Coast Guard, for example, sponsored projects to



test a range of booms in large tanks. Finally, a range of standards were developed that were to prove invaluable in assisting the simplicity and cost-efficiency of deploying in-situ burning equipment.

## **PYROBOOM®**

Derived from the work begun at Albany International, the fireboom product Applied Fabric Technologies, Inc. (later merged with DESMI, itself a global leader in oil spill clean-up equipment) finally came up with what was dubbed PyroBoom®. PyroBoom® is essentially a highly fire-resistant oil spill barrier that utilizes a unique, woven blend of refractory yarn and metallic materials to yield a fabric to which a polymer coating is then applied. Flotation is provided by a series of stainless steel hemispheres, containing a high-temperature resistant, closed cellular material. The fireboom's proprietary Inconel/Fiberfrax® refractory fabric with its silicone coating has been tested to withstand repeated burnings at temperatures up to 1315°C/2400°F without catastrophic failures. From the outset, PyroBoom® was designed to be simpler to use than existing firebooms that were known to be complicated to use, requiring extensive training and practice. Worse still, competing products quickly became water-logged, with dramatic weight gain that made subsequent retrieval difficult, and drying, storage and

maintenance virtually impossible in field conditions. PyroBoom®, on the other hand, requires no external accessories or cooling pumps, and is far lighter so as to enable easier handling.

## **FIREBOOMS TO THE RESCUE**

PyroBoom® got its first big break – and a chance to show what it was really made of – when the Deep Water Horizon disaster struck in 2010. The call went out for clean-up equipment around the world, including in-situ burning booms. DESMI joined the effort, with PyroBoom® playing a key role as in-situ burning helped to greatly reduce the amount of oil hitting the beaches and marshes. *“Our product really shone. The guys doing the in-situ work got maybe two to three burns out of the old firebooms before it all had to be thrown away after a couple of weeks at best,”* says Peter Lane. *“In fact, out of the four fireboom products brought in, only two performed to any reasonable level. And that was despite trialing various ways of towing the boom, different sea conditions and so on.”*

One of the two booms to prove most reliable in use was the PyroBoom®, standing strong even when subjected to repeated burns during as much as 4 days of 24 hour immersion. And it was this product that won the lion's share of re-stocking among the various organizations around

the world who had supported the clean-up effort.

*“Beyond the fact that the material is so durable, it seems to be the simplicity of the PyroBoom® that makes it so interesting,”* says Peter Lane. *“It's handled and operated like an ordinary boom, works in any environment and there are no pumps or maintenance to worry about.”* Despite having the leading product, DESMI isn't resting on its laurels. *“The material itself is very robust. But going forward, we're looking at ways to make PyroBoom® work more efficiently, working with several organizations to come up with more efficient ways to increase sweep speed and extend the useful lifetime. We are also examining safety aspects, aiming to mechanize handling so as to remove any risks there might be in manual procedures.”*

DESMI's R&D team is looking at ways to improve burning results, too – whether in-situ or in conjunction with skimmers. A key issue is the need to broaden the current operating envelope: presently, in-situ burning can be undertaken in a relatively narrow range of weather and sea conditions. *“During the Deep Water Horizon cleanup, we had relatively calm conditions,”* says Peter Lane. *“And, because the disaster was a blow-out, there was fresh, thick oil every day. That made it perfect for a fireboom solution, which was highly economical in comparison with mechanical recovery.”*

### **ADVANTAGES OF IN-SITU BURNING**

- Removes large quantities of oil quickly
- Eliminates the recovery and disposal chain
- Practical in a wide range of conditions, including broken ice, open water, intertidal zones, rivers, swamps and marshes
- Low net environmental impact when performed properly



## ENVIRONMENT

Since clean-up operations, no matter which technique is used, are all about protecting the environment, the idea of a burning oil slick with a thick, dark cloud of smoke entering the atmosphere may appear counter-productive. Here however, Peter Lane is quick to point out the relatively positive environmental effects of in-situ burning: *“A lot of work has been done on the content and effects of the smoke cloud. We’re just creating soot, which is straight carbon. It looks nasty, but it goes away quickly and the smoke plumes aren’t as large as you might think. We’re effectively eliminating almost all of the toxic constituents, for the most part leaving only solid carbon, carbon dioxide, carbon monoxide and a minor amount of liquid oil when the day is done. The products and residues of the combustion are a very small fraction of the initial spill. They usually float, and can be recovered mechanically after burning.”*

## SLOW BUT STEADY PROGRESS

With the Arctic region playing host to a growing number of vessels and offshore platforms, DESMI's efforts to further refine in-situ burning are crucial to protecting the future of the local environment and wildlife. But advances in the market for fireboom equipment and techniques are few and far between. The problem, according to Peter Lane and his

team, lies largely in the fact that, thankfully, major accidents are uncommon, low-probability events.

*“The problem in the oil spill industry is that it can take a very long time for new ideas to come to market – and even new, disproven ideas take time to leave. With Deep Water Horizon, ideas came out of the woodwork that had been shown to be bad ideas back in the seventies. Now they have resurfaced all over again and they’re still bad.”*

With oil spills hardly an everyday occurrence, and few players as seriously involved as DESMI, the pace of technological development is slow. Every new event raises the level of interest for a period of time, bringing fresh people into play who, according to Peter Lane, don't have enough experience in the industry to realize that many of their ideas have been unsuccessfully tried before. Thankfully, there are a number of organizations in or around the oil industry that front up with R&D funding aimed at evaluating new concepts for in-situ burning and bringing the best of these to a commercial level.

## HEARTS ON FIRE

*“We’ve been involved in in-situ burning almost as long as it has been a concept,”* says Peter Lane. *“We’ve developed products and operating techniques, and played a big role in*

*setting standards. It’s second nature to us – and we feel we’re doing something that can really make a difference.”* The dedication of people like Peter Lane and Peter Newsom, another long-time fireboom expert who joined the team in 1992, has clearly influenced developments. In fact, the company is itself the direct result of a chance meeting between Peter Lane, representing Applied Fabric Technologies, Inc., and a sales representative from DESMI in the summer of 2008. The meeting's objective was to sell a fireboom to an Algerian company.

*“I met the DESMI sales guy in Algeria when we visited the company. It turned out they had invited several vendors, but we were the only two companies willing to go the distance. During our visit, we were able to demonstrate the utility of some of the simple standards we’d helped to develop, such as the end connector design that enables different booms to easily be hooked together. I also realized that DESMI, despite its size in the world market, wasn’t selling much of its range of products in North America. So we managed to unite the two companies, and suddenly there was a lot of synergy that worked out well for both. In fact, joining together has brought several products to market that probably couldn’t have come into being without it. It’s been a really good marriage”.*



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