

WATER MAKERS & WATER TREATMENT

FOR THE OIL & GAS INDUSTRY



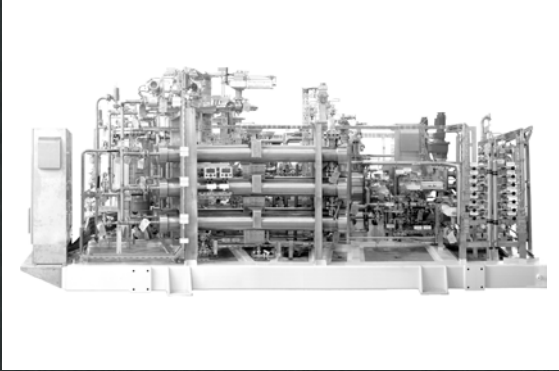


ENWA WATER MAKERS & FILTRATION SYSTEMS

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WHY CHOOSE REVERSE OSMOSIS?



All large scale Reverse Osmosis equipment is planned in detailed and precise 3D rendering.

ENWA has over the past 30 years built up manufacturing capacity and experience with desalination plants to meet different demands. From small units making 1,5 m³/day on board pleasure boats to the cruising industry and hotels demanding 3000 m³ top quality drinking water per day. We meet special demands from the Oil & Gas industry, complying with industry standards and specialized industrial standards.

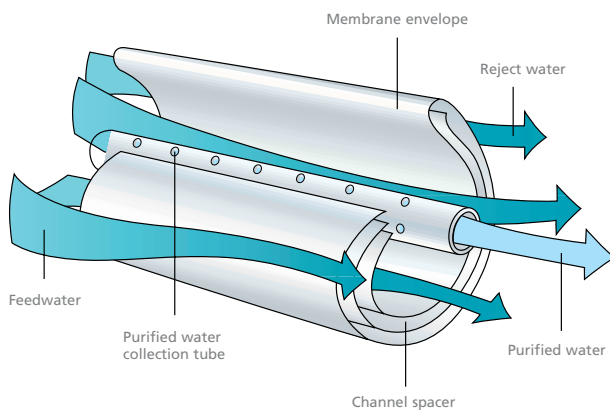
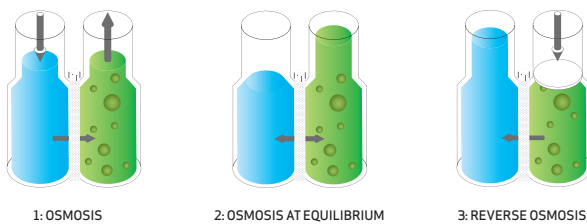
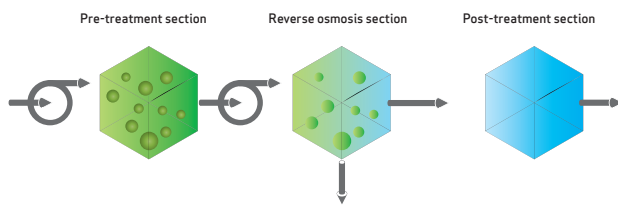
Supply of fresh water is an important issue in an offshore environment. ENWA's systems using the Reverse Osmosis process will in most circumstances be the most efficient, economical, and environmentally friendly way to secure that supply.

The use of our proven Reverse Osmosis technology minimize the risk of contamination, such as Legionella and E-coli, so often found in bunker water.

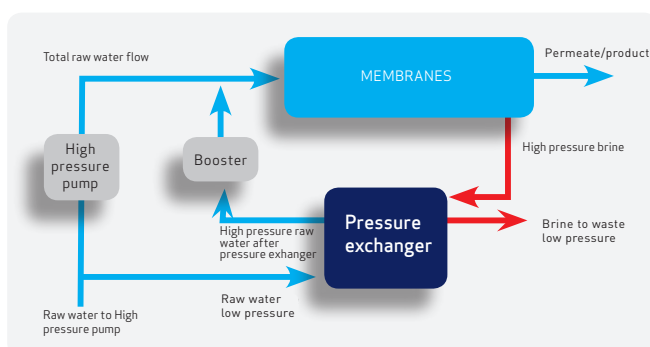


PRODUCING DRINKING WATER

THE PROCESS OF REVERSE OSMOSIS



ENERGY RECOVERY



Several techniques are available. Enwa Water Treatment uses Reverse Osmosis to remove salts and minerals from sea water, brackish water or contaminated fresh water. All of our systems deliver to World Health Organisation standards.

1: OSMOSIS

Osmosis is a natural process, which induces water to flow from a diluted saline solution and through a membrane to a more concentrated salt solution. The concentrated solution then becomes diluted.

2: OSMOSIS AT EQUILIBRIUM

The flow of pure water through the membrane continues until the concentration of salt is equal in both solutions. The difference between the water level in the container, on each side of the membrane, is the osmotic pressure.

3: REVERSE OSMOSIS

By applying pressure greater than the osmotic pressure to the concentrated salt solution, the process can be reversed. Pure water will then pass through the membrane and flow into the weaker salt solution. Desalinated water is thus obtained by means of dilution.

The spiral-wound module consists of two sheets of membrane, that are placed on both sides of a channel spacer. The three pieces are then sealed on three sides to form an envelope. The remaining open side is attached to a perforated purified water collection tube. A woven plastic sheet serves as a spacer and is laid on one side of the membrane envelope. The membrane envelope and spacer sheet are rolled up into a cylindrical bundle.

A large scale Reverse Osmosis system uses considerable amounts of energy. With energy prices on the rise, this is one of the most important factors determining total costs.

To minimize total energy consumption using ENWA recovery system it is possible to reduce energy consumption by 60%. This energy recovery makes it possible to desalinate sea water with only 2 kWh/m³. A normal desalination plant wastes the energy of the outgoing waste water, this water has a pressure of 65 bars and is normally discharged directly to the sea. The system is recommended for watermakers starting at 250 m³/day.

REDUCING CHLORINATION WITH ENWA BIN-X®

REDUCE CHLORINATION TO A MINIMUM. USE ENWA BIN-X MEMBRANES. FRESHWATER - CHEMICAL FREE BACTERIOLOGICAL BARRIER

In drinking water systems, water is exposed to conditions that creates a possible hazard to its quality.

ENWA's BIN-X is a patented cost-effective water treatment system used for removal of particles and bacteria such as Legionella and E-Coli from potable water/drinking water, offering maximum security against such epidemics. With the ENWA BIN-X, this can be achieved with a moderate level of investment.

Traditionally, UV systems are used to neutralise bacteria in potable water systems. The ENWA BIN-X employs ultra filtration to actually remove the bacteria, and the membranes are self maintained by an automatic patented backwash/flush technique. Consequently time spent on system maintenance is very limited.

The ENWA BIN-X holds VA (water and discharge) approval for installation in drinking water. It operates in temperatures up to 80°C, so both cold- and hot- water systems can be treated with the ENWA BIN-X.

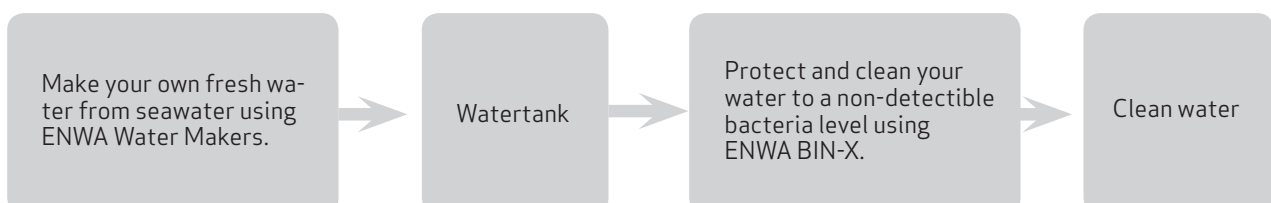


The seven-hole capillar tube membranes.

STATENS SERUM INSTITUT (DENMARK)

“The report concludes that the concentration of legionella contamination was reduced from 10 000 CFU pr/litre to a non-measurable level!”

CLEAN WATER TANK CLEAN PIPE DISTRIBUTION MINIMUM CHLORINE



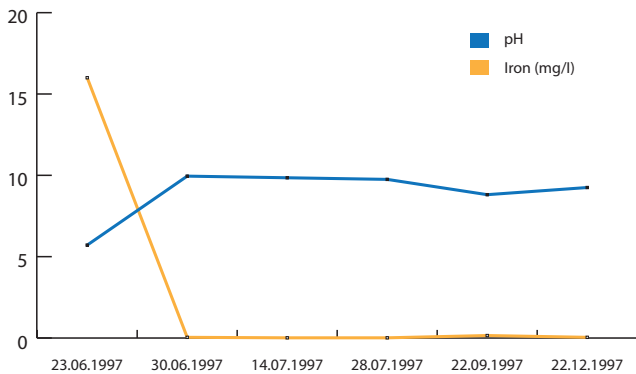


SPECTRA OF VARIOUS FILTRATION METHODS

- Sugar -	Virus		Bacteria	Pollen	Sand
- Dissolved salts -	Colloids				
			Particle filtration		
		Micro filtration			
	Ultra filtration				
	Nano filtration				
Reverse osmosis					
Ion Exchanger					

ENWAMATIC® CHEMICAL FREE WATER CONDITIONER

- Comfort cooling and heating systems (hvac)
- Engine cooling systems
- Water cold machinery



The graph illustrates the effectiveness of the carbonate balance/ pH shift approach in the control of corrosion - 6 months trial - Norske Veritas, Norway. Non-detectable level of corrosion.

ENWAMATIC®

In any freshwater based, closed loop, cooling or heating system there is a certain quality of the water used for heat transport and exchange. The quality of the water is very much a source of degeneration of the system in form of corrosion, scaling and bacterial growth.

Corrosion, scaling and bacterial growth reduces the systems ability to exchange and transport heat. If the water is left without any treatment, the system will rapidly degenerate and cause operational problems and high maintenance cost. If treated in the right way, such degeneration can be stopped. Particles and bacteria will be removed from the system and corrosion will be stopped. This will make great savings in both operational and maintenance cost and will protect your investment in the best way.

Traditionally this treatment has been performed using chemical injections. This is a rather expensive treatment method as chemicals have to be purchased, handled and disposed of according to strict rules and regulations. Chemicals can be harmful to the environment, and represent a potential hazard to the people handling it.

ENWA's DNV approved (report no 270113) EnwaMatic® technology provides a safe, chemical-free and environmentally friendly solution that also will make great savings in the operation of your systems.

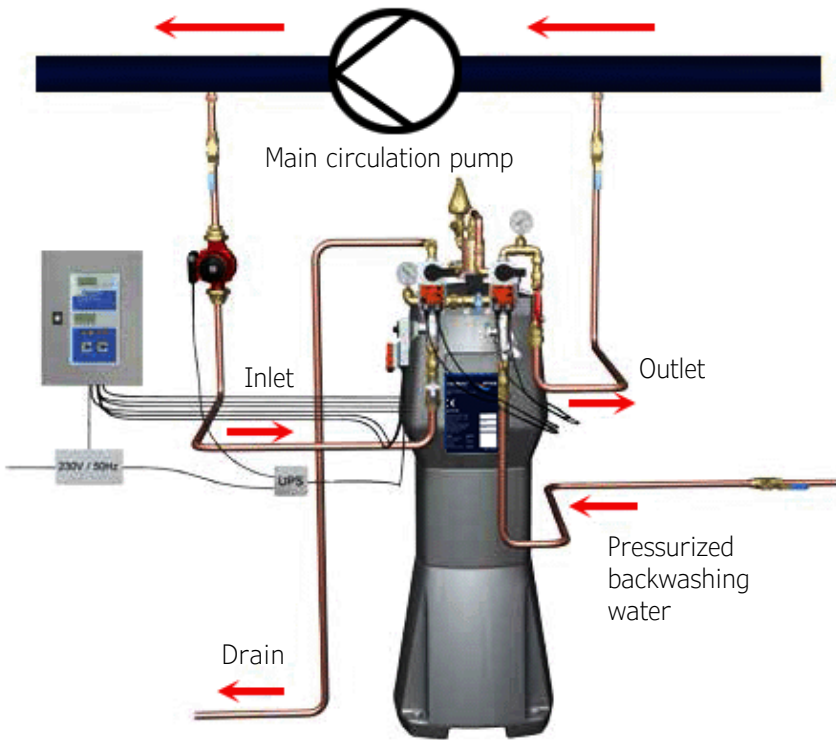
DNV TECHNICAL REPORT NO. 27013BSC.N1 (DET NORSKE VERITAS)

The copper, iron and zinc contents have decreased to approximately 0 mg/l during the test period. Further the particle content has been distinctively reduced. The weightloss measurements show that C-Mn steel was not susceptible to corrosion in the treated water during the test period. Hence the testing shows that the corrosivity of the water has been reduced as result of the water treatment.

Water samples from system treated with EnwaMatic® technology. From day 0 to day 30 to the right.



THE ENWAMATIC® PROCESS



ENWAMATIC® FUNCTIONS:

- Corrosion inhibition
- Scale control
- Side-stream filtration to < 5 microns
- Environmental control of bacterial growth
- Air separation

ENWAMATIC® BENEFITS:

- Reduced energy consumption
- Prolonged system lifespan
- Reduced service and maintenance costs
- Cost-effective alternative to chemical dosing
- Continuous filtration and self-regulating water treatment
- Non-scouring solution for refurbishment projects
- Environmentally sound technology

HEALTH, SAFETY AND ENVIRONMENT

- EnwaMatic® will create an ideal documented 'Clean Ship' Water Treatment environment
- No Hazardous Chemicals
- Drained water consist only of harmless particles
- Closed loop operation
- Automatic operation without the potential for mechanical failure
- Make up water can be pre-treated by passing through the EnwaMatic®
- The unit is bolted to the deck and attached to the walls to prevent movement
- Low Voltage System
- The EnwaMatic® is bolted to the deck to a sorb static forces
- High grade insulation
- No corrosive materials
- No sharp edges

DESIGN AND APPROVALS

- Wärtsilä Oy of Finland, long term test
- 10 years documented experience with the technology
- World patent
- DNV test report
- Cranfield University, School of Water Science
- EnwaMatic® is the only water treatment system on the German market fulfilling water treatment and environmental demands.
- Pioneering ship companies are recommending EnwaMatic® in their specifications



EnwaMatic® Technical information	EnwaMatic® Maritime F1	EnwaMatic® Maritime F2	EnwaMatic® Maritime F3
Capacity (m3)	0 - 7	0 - 20	0 - 40
Power (W)	25-30	25-30	25-30
Width (mm)	550	600	600
Depth (mm)	550	600	600
Height (mm)	1500	1700	2000
Weight empty (kg) inclusive automatic head	30 kg	45 kg	50 kg
Weight full (kg) Inclusive water.	90 kg	200 kg	240 kg

Capacity is the total volume of water within the closed loop of cooling/heating water.

Weight empty is the dead weight without filter media. Weight full is the calculated weight inclusive filter media and water.

Optional: real time monitoring with alarm functions

AFTERSALES AND SERVICE LIFE CYCLE COST

We know that we deliver good systems, but that alone is not enough to ensure satisfied customers. Our customer's experience of doing business with us is also dependant on our ability to deliver top-class after sales and service. This is why we give it priority as one of our key areas. For our systems, regular service is as important as the initial purchase. Life Cycle Cost (LCC) is dependent on service to meet the cost/benefit target.

Many of our customers have a certain time window service or repairs MUST be performed in. Therefore speed of response, and reliability, form the core of our service philosophy.

Our service teams are involved in construction, installation and commissioning, as well as the training of the customers' own operatives in the running, supervision and routine maintenance of the systems, sometimes with yearly refreshment-courses. This secures an in-depth knowledge of both products and

customers. The lessons learned from these processes are used to improve the products and delivery process through our ISO 9001-2008 system.

Our service teams provide world-wide service to ensure safe and reliable operation.



REFERENCES

We have over 40 years of experience. These are some of our satisfied customers:



STATOIL – GUDRUN



PROSAFE - SAFE ASTORIA



ODFJELL - DEEP SEA STAVANGER



OCEAN RIG - EIRIK RAUDE



STATOIL - HULDRA



CONOCOPHILLIPS - EKOFISK



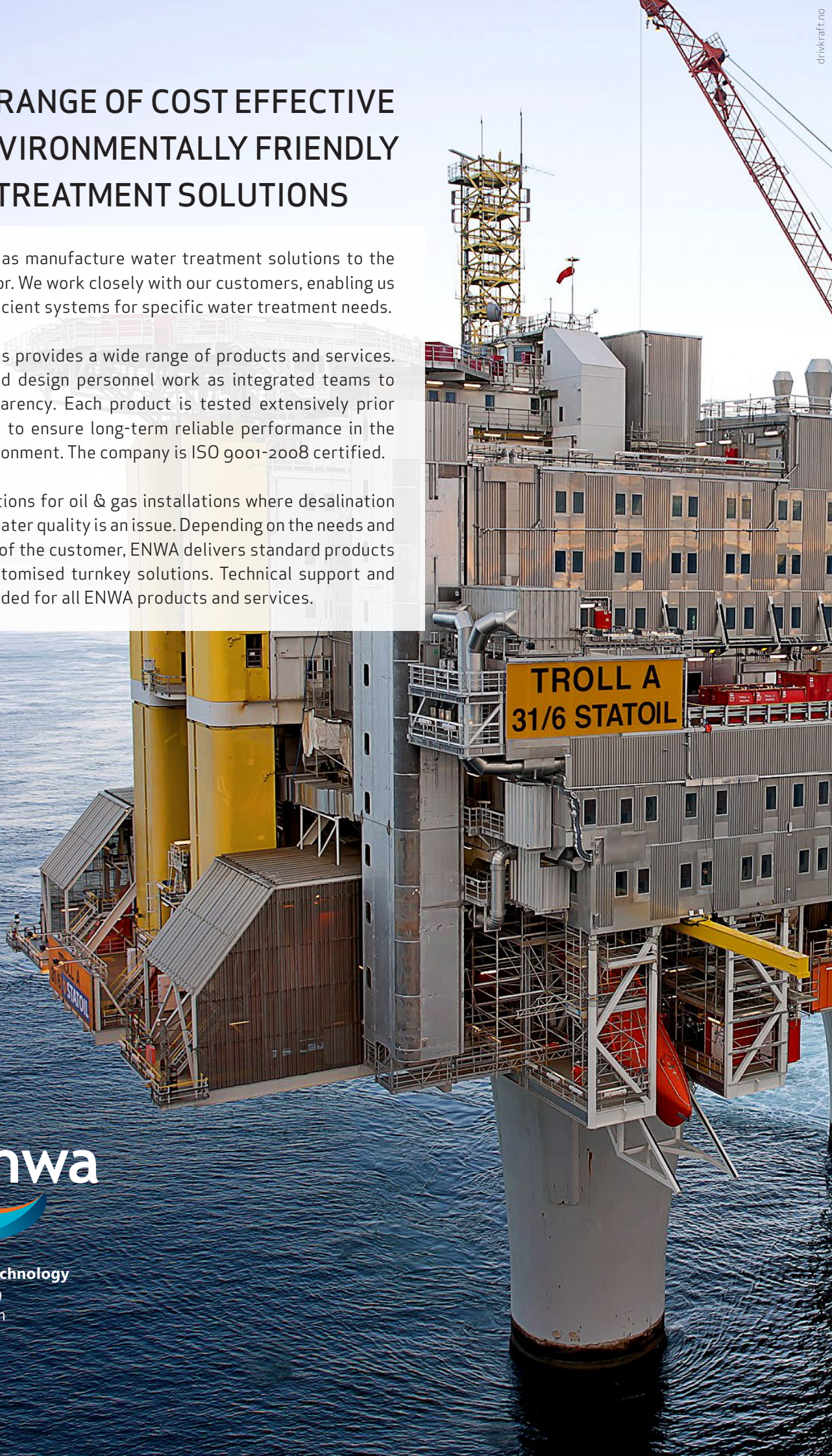
STATOIL – VALEMON

A FULL RANGE OF COST EFFECTIVE AND ENVIRONMENTALLY FRIENDLY WATER TREATMENT SOLUTIONS

ENWA Oil & Gas manufacture water treatment solutions to the offshore sector. We work closely with our customers, enabling us to provide efficient systems for specific water treatment needs.

Enwa Oil & Gas provides a wide range of products and services. Production and design personnel work as integrated teams to ensure transparency. Each product is tested extensively prior to installation to ensure long-term reliable performance in the offshore environment. The company is ISO 9001-2008 certified.

We offer solutions for oil & gas installations where desalination of water and water quality is an issue. Depending on the needs and requirements of the customer, ENWA delivers standard products as well as customised turnkey solutions. Technical support and advice is provided for all ENWA products and services.



Enwa Water Technology

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