

TOGETHER WE ARE MAKING WIND POWER

safer

by helping to avoid malfunctions
and the fallout of control devices



healthier

by delivering products that allow to win
power from a renewable energy source,
as well on shore as off shore and even
under adverse weather conditions



more productive

by ensuring the permanent and
failure-free operation of wind
power plants



YOU SECURE THE ENERGY SUPPLY OF THE FUTURE, WE SECURE THE PERFORMANCE OF YOUR SYSTEMS AND EQUIPMENT



THE PRODUCTION OF ENERGY FROM REGENERATIVE SOURCES is an important contribution to climate protection and a sustainable business field. Wind power systems convert the kinetic energy of the wind into electrical energy via their rotors and the associated drive system - of course only when the wheels keep moving.

WITH EFFICIENT FILTER SYSTEMS that clean hydraulic fluids and lubricating oil from system-related impurities and from contaminations from air or water, Filtration Group contributes to the economical operation of offshore and onshore wind turbines. Air filters prevent corrosion and premature wear of control elements in

the Nacelle and the Tower. To prevent salt water from corroding the technology or oil and lubricants from being washed into the sea, separators ensure clean separation of the liquids reliably and without the use of chemical additives.

WITH SOPHISTICATED AND POWERFUL SOLUTIONS, Filtration Group contributes to a stable economic and ecological balance of wind turbines. Our expertise and know-how are designed to advance your business model of an environmentally friendly and secure energy supply for the future. All in the spirit of our credo:

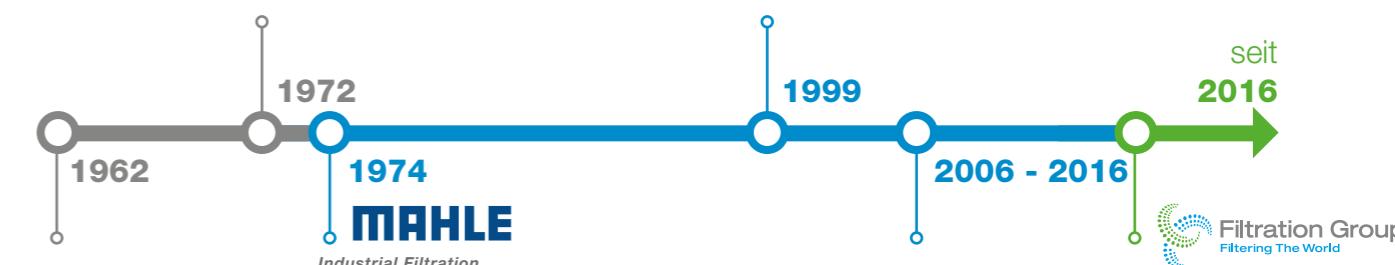
WE INSPIRE OUR CUSTOMERS.

OUR HISTORY

Decades of experience and the bundled expertise at a production site characterize the quality feature of the Filtration Group product. A wide range of high-quality products in the field of filter technology has been developed under various names.

The **Purolator** subsidiary in Öhringen takes over the responsibility for the European market. In the same year, MAHLE joins **Knecht**, which manufactures filters for Purolator.

The **Knecht** company merges with the **MAHLE Group**. In Öhringen, the company has become the largest employer with 800 employees, and the filter division has become the cornerstone of the Group.



The American company **Purolator** sets up the first location of an international subsidiary in Öhringen. In addition to filters for motor vehicles, industrial filters were also produced from 1966 onwards.

MAHLE purchases Purolator Öhringen, but continues to manufacture the filters under the well-known brand name. After the license agreement expired in 1990, filters from Öhringen are sold exclusively under the brand names Knecht and MAHLE.

MAHLE acquires Norddeutsche-Filter-Vereins GmbH (NVF) and AKO Filter GmbH; two years later, the Amafilter Group based in Alkmaar, the Netherlands, is added. From 2011, MAHLE Filtersysteme GmbH and MAHLE Industriefiltration GmbH will operate in Öhringen as two independent companies under one roof.

The American filter specialist **Filtration Group Corporation** has integrated the industrial filtration sector into its family of companies. The company, a subsidiary of Madison Industries, operates over 100 sites in 28 countries.

AREAS OF APPLICATION

ELECTRICITY FROM WIND POWER: THIS IS HOW THE WHEEL IS BEING TURNED

The wind industry makes an important contribution to the energy revolution and to a future-oriented power supply. In order to have a secure future, wind turbines have to be running economical. This requires reliable and durable operation even under adverse weather conditions. With highly developed filter modules and separation systems, Filtration Group creates the prerequisites for this and works hand in hand with manufacturers and operators of wind turbines to continuously develop flexible and efficient solutions.

1 Pitch system

To ensure continuous operation and to protect the wind turbine during storms, the **pitch system** uses hydraulics to adjust the alignment of the rotor blades to the wind conditions.

- Medium pressure filters
- Air breathers
- Filter elements / EcoParts

2 Gearbox

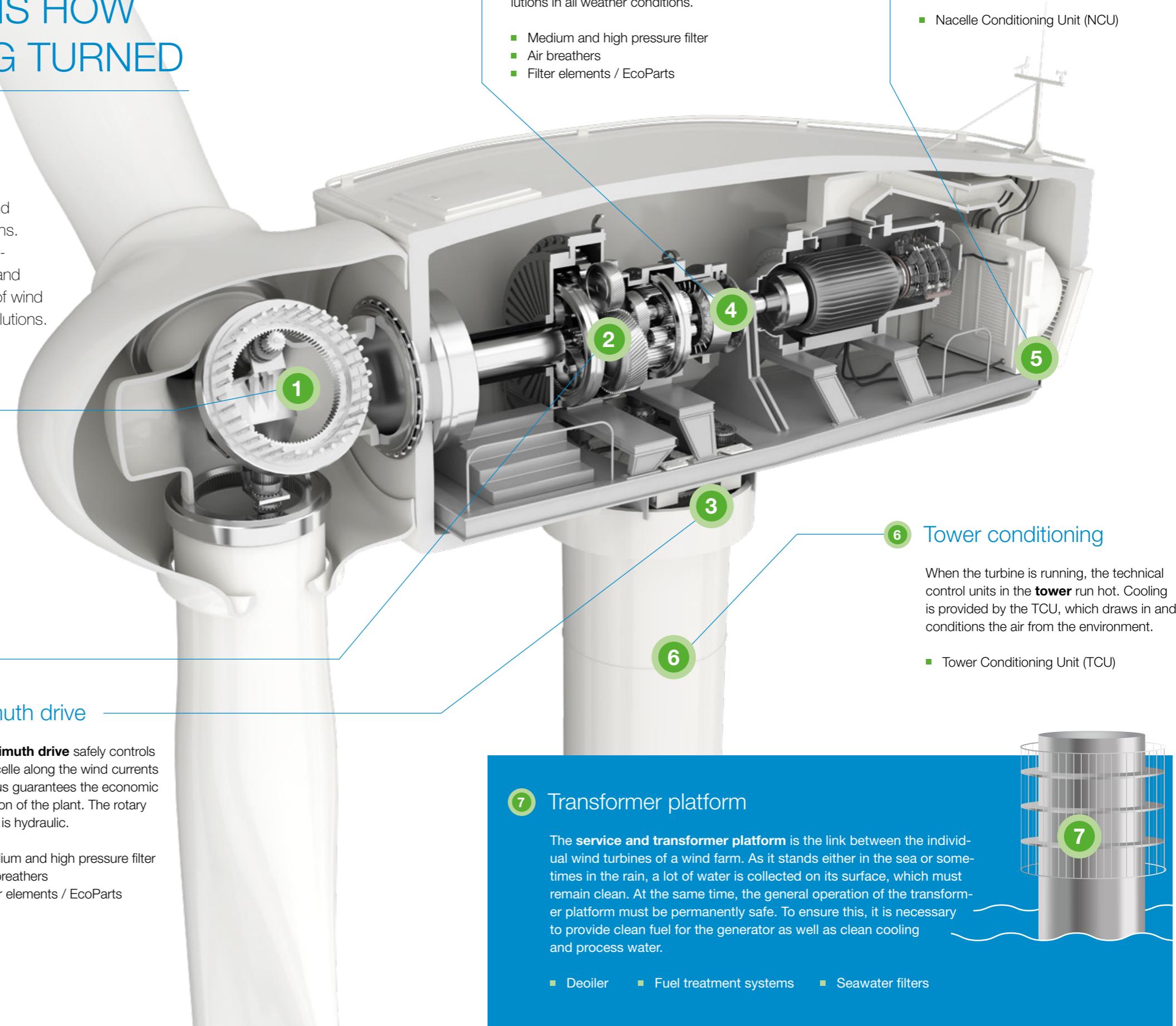
At the **gearbox**, a gear train converts the kinetic energy of the wind into mechanical energy, which sets the turbine within the power generator in motion. The heart of every wind turbine only runs at full speed when lubricated sufficiently.

- Oil filter modules
- Offline Filter Systems
- Spin-on cartridges
- 2 or three-stage filter elements

3 Azimuth drive

The **azimuth drive** safely controls the nacelle along the wind currents and thus guarantees the economic operation of the plant. The rotary motion is hydraulic.

- Medium and high pressure filter
- Air breathers
- Filter elements / EcoParts



4 Hydraulic break system

Depending on the wind speed, the wind turbine must be slowed down to prevent damage to the turbine. The **hydraulic break system** is based on a hydraulic system that allows controlled revolutions in all weather conditions.

- Medium and high pressure filter
- Air breathers
- Filter elements / EcoParts

5 Nacelle conditioning

The **nacelle** contains the technology and mechanics for the control of the wind turbine. Here it is important to keep the turbines head cool.

- Nacelle Conditioning Unit (NCU)

6 Tower conditioning

When the turbine is running, the technical control units in the **tower** run hot. Cooling is provided by the TCU, which draws in and conditions the air from the environment.

- Tower Conditioning Unit (TCU)

7 Transformer platform

The **service and transformer platform** is the link between the individual wind turbines of a wind farm. As it stands either in the sea or sometimes in the rain, a lot of water is collected on its surface, which must remain clean. At the same time, the general operation of the transformer platform must be permanently safe. To ensure this, it is necessary to provide clean fuel for the generator as well as clean cooling and process water.

- Deoiler
- Fuel treatment systems
- Seawater filters

WHATEVER THE WIND MAY BRING: WITH OUR SOLUTIONS WE GENERATE PURE ENERGY FROM IT

Highly developed filter and separation systems ensure trouble-free operation of all hydraulic and mechanical equipment of a wind turbine and ensure clean separation of water and fuels on the service and transformer platform.

AIR BREATHER PI 0126

Air breathers for hydraulic and lubricating oil tanks prevent contamination with dust, dirt or salt particles from the ambient air. Design and material have proven themselves over decades of use. Our air breathers are practical to use, robust and durable.



BYPASS OIL FILTER MODULE PI 8400

The newly developed filter module sets new standards in off-line filtration and is compatible with the previously used compact systems. The water-absorbing premium filter elements with PulseShield™ technology filter with a fineness of 3 µm. They reliably separate even finest particles and oil aging products (varnish).



FLANGE FILTER PI 340

The medium pressure filter as well as the valves and maintenance indicators used in the filter are designed for industrial use and withstand extreme requirements. The equipment with premium filter elements with PulseShield™ Technology makes the Pi 340 a safe bench when it comes to reliable and long-lasting operation of the hydraulic system.



OIL FILTER MODULE (OFM) PI 83116

The compact OFM was developed in cooperation with the manufacturers specifically for use in wind turbines to keep lubricating oils clean and the hydraulic elements running. Venting is integrated in the filter cover, and draining possibilities exist on the raw and clean sides of the OFM. The PI 83116 is supplied in such a way that it can be connected in a few simple steps, and the maintenance indicator is located in an easily accessible place. The high-performance two or three-stage filter elements with PulseShield™ technology can hold up to 30 percent more dirt than conventional filter elements.



FILTER ELEMENTS

The special design of the PulseShield™ filter elements allows them to absorb 30 percent more dirt than conventional filter elements. Even under extreme conditions, the surface structure retains its high separation efficiency and thus guarantees trouble-free operation of the hydraulic system.



PULSESHIELD™ TECHNOLOGY

The glass fibre layers of the PulseShield™ filter elements retain 30 percent more dirt than the surfaces of conventional elements. The highlight of the patented technology, however, lies in the outer sheath: This is shrunk in such a way that it presses the folded filter material so tightly onto the inner core that pressure fluctuations have no effect on the separation performance. At the same time, PulseShield™ technology makes the filter element more durable.

ECOPARTS

In addition to the filter elements for FG original housings, Filtration Group offers a wide range of hydraulic and air filter elements that also fit into equipment from other manufacturers. The products in the EcoParts series combine compatibility with the certified quality seal of Filtration Group. This stands for a defined filter performance, cleanliness class and service life as well as reliable testing according to DIN and ISO standards with all common industry approvals.



SPIN-ON CARTRIDGE PX 37

The streamlined design of the PX 37 components ensures minimal pressure loss. With a permissible nominal pressure of 16 bar and optimum separation performance, Mic-, Sm-X and Sm-N filter elements help to clean the oil to ensure permanent operational reliability of the gearbox in a wind turbine.



PRODUCTS

Innovative technologies and best practices for optimal results



Efficient Separation Systems for the Service platform and transformer station

DEOILER 2000

On the transformer platform of a wind farm, spray and rainwater are often contaminated with chemicals and oil. This surface water must be cleaned before it can be returned to the sea. The PPT BWS (MESB) or simpler: Deoiler 2000, with a separation efficiency of 5 ppm residual oil content, already meets the standard of the future today. The system is based on the proven coalescer principle, which makes use of the different physical properties of oil and water. Multi-phase separation and mechanical emulsion and foam breaker are split in two pressure vessels in the Deoiler 2000.



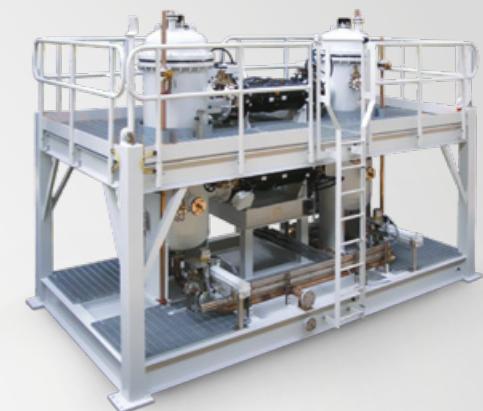
FTS / OTS

In the event of a breakdown, emergency power generators maintain operation on the service and transformer platform. To ensure that the gensets are always ready for operation, too much water must not accumulate in the oils and fuels. Microorganisms and fungi, such as the dangerous diesel pest, can develop in the oil and fuel and cause deposits and malfunctions. The multi-stage separation systems filter the fuel as an FTS or the oil as an OTS before the coalescer elements. The filtration efficiency can be precisely adapted to the respective technical requirements. If necessary, a downstream separator membrane reduces the water content to below 20 ppm.



SEAWATER FILTER

In order to be able to use seawater as cooling or process water, Filtration Group seawater filters separate salt and other solid particles cleanly and reliably. From fully automatic backwash filters to self-cleaning or manually replaceable screen basket filters in versions as simplex, duplex or backwash filters, there is a suitable system for every application scenario. A large selection of different materials, filter elements and connection sizes allow flexible solutions for individual requirements.



Filter systems for tower conditioning

TOWER CONDITIONING UNIT (TCU)

The tower of each wind turbine houses central control units as well as the turbine for the power generator. An intake air filter system prevents the technology from overheating by regulating the temperature with cool ambient air. Salt particles and moisture must be filtered from this intake air to prevent corrosion of the turbine and other technical equipment. Filtration Group's new generation air intake filtration system, with a special plastic housing and the patented, efficient DropSafe™ pocket filter, meets the wind turbine manufacturers' demands for optimal design and maximum performance.



DROPSAFE™ POCKETFILTER

The DropSafe™ pocket filter combines the advantages of material, process and design in a compact system. A filter material specially developed FG-Filtrair is welded together to form bags. This patented bellows retains salt and particles, the water is separated by the hydrophobic filter material by the proven coalescer principle and is collected in containers upstream of the filter.

Filter systems for nacelle conditioning

NACELLE CONDITIONING UNIT (NCU)

The nacelle of each wind turbine contains drive and braking systems for the rotors and the nacelle itself. An air conditioning system prevents the units from overheating during operation and the viscosity of the hydraulic fluids from being impaired. However, the ambient air drawn in must first be filtered. The NCU from Filtration Group ensures that no dust, pollen or insects get inside the nacelle and thus contributes to the reliable continuous operation of the system.



INCLUDED IN DELIVERY: OUR DRIVE TO INSPIRE YOU



STILLSTAND? NOT WITH US!

From the complete system to the individual filter element, we always have all products in stock to guarantee trouble-free operation of the wind turbine and transformer platform. Filtration Group stands not only for top quality, but also for short delivery times - worldwide.

FG QUALITY FOR EVERY SYSTEM

Our EcoParts are spare parts and filter elements that are compatible with systems from other manufacturers. A comprehensive portfolio and an economically well thought-out stock organization enable fast delivery of the right product worldwide.

WE TURN IT INTO YOUR PERSONAL THING

On request, we can also print our customers' company logos on filter elements. In the case of products from Filtration Group range, this name automatically stands for top quality in the field of filter and separation technology.

TAILOR-MADE SOLUTIONS? NO PROBLEM!

Although the principle of operation is always the same, the design of wind turbines can differ considerably from one another. Filtration Group therefore also develops special elements and modules in cooperation with the manufacturers and operators of the plants, which exactly meet their requirements.

WE'LL FIND OUT WHAT'S GOING ON

The evaluation of measurement data in the laboratory provides valuable insights for an exact system diagnosis and builds the basis for application-related adaptations of individual modules. This analysis primarily serves economic efficiency by extending maintenance intervals and service life in equal measure.

CONSULTING TO THE POINT

Decades of experience and great innovative strength are the core values of Filtration Group, which our customers can use even before they buy. As proven experts, our contacts will be happy to advise you which filters achieve the best results in their specific application.

GOOD SOLUTIONS



“ Clean energy generation at all levels

Germany's first commercially operated wind farm was commissioned in the Baltic Sea in 2011. 21 wind turbines generate electricity for 50,000 households annually and save 167,000 tons of CO₂ compared to conventional electricity generation.

The spray and rainwater that accumulates on the wind farm's transformer platform mix with various oils from leaks and chokes. To protect the oceans, the water may only be returned to the Baltic Sea with negligibly low residual oil content. Therefore, a Filtration Group Deoiler 2000 was installed on the platform, which purifies the water according to the applicable environmental regulations of IMO MARPOL MEPC.107(49). Separated oils and solids are collected in a container and are professionally disposed later. The oil deoiler 2000 was supplied as a plug & play solution, the disposal unit was housed in a separate container. The Filtration Group's separation system has been running reliably ever since and is hardly causing any costs.



WORLDWIDE AT OVER 100 LOCATIONS IN 28 COUNTRIES



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Further information about our products and a local contact person from our worldwide partner network can be found on our website: www.fluid.filtrationgroup.com/en-US/contact

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