

Oxygen Transfer Technology

EFFICIENCY BY DESIGN



OTT GROUP



A warm welcome from the technology leader in wastewater aeration.



THE MODERN HEAD OFFICES OF OTT GMBH IN THE LANGENHAGEN DISTRICT OF HANOVER

Our leading position is by design.

For over twenty years OTT has been working successfully in the field of wastewater aeration. Our intention was and is to produce the best performing and most efficient and reliable diffuser and aeration systems possible.

Our holistic company philosophy is:

Everything from one source.

At OTT, the Development, Production, Quality Control and Project Management

departments are concentrated in one location.

Over twenty years of experience manufacturing membrane diffusers in the most up-to-date production facilities plus meticulous quality checks make OTT a highly performing, reliable partner – as good as it gets.

At its own stainless steel processing plant, OTT produces perfectly tailored pipework and aeration systems. Where it makes sense, we also work with domestic stainless steel fabricators in countries all around the world.

This ensures that OTT aeration systems are operated with the greatest reliability for both municipal wastewater treatment and the most demanding areas of application such as the chemicals industry.

We're somewhat old-fashioned at OTT: "Traditionally the latest technology."

Continuous research and development together with changes inspired by customer feedback have made OTT the industry's technology leader.

Close collaboration with universities and leading research institutes – in particular in the field of membrane materials – gives us the benefit of valuable synergistic effects.

This scientific dialogue has built our long-term position as market leader. External, independent test laboratories repeatedly provide renewed confirmation of the outstanding performance of OTT aeration systems.

OTT stands for solid engineering virtues: thoroughness, reliability and efficiency.



Quality – Made in Germany.

Our diffusers and membranes are produced from the highest quality materials. Likewise, components integrated into our systems are also

of the highest possible quality, assuring system longevity and reliability.

From Hanover into the wide world – our global distribution system*

Staying close to the customer is very important to us. More than 20 international sales partners provide technical and logistic assistance to keep us informed and in touch.

You too can benefit from the strengths of Germany's leading diffuser manufacturer.

We provide swift and comprehensive planning support – from process and energy optimisation through design of an aeration system, pipework construction and assembly, to after-sales service – with the guarantee of quick response times and strong commitment from the whole, highly qualified OTT Group team.

Uncompromising quality and the most up-to-date production methods explain why OTT can successfully provide a technically superior, highly sophisticated product.

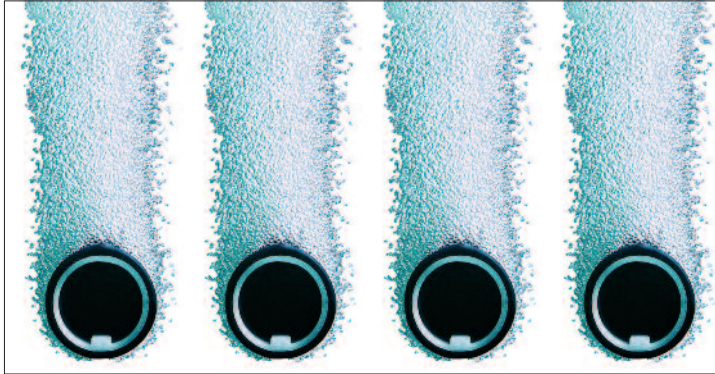
Increasingly, operators who care about the »total aeration experience« choose OTT. When they consider efficiency and reliability, total life cycle costs, ease of installation and maintenance and environmentally sound choices in engineering, the choice becomes clear.



AT OTT, WE'VE MADE CLIENT PROXIMITY OUR CAUSE AND CREDO. WORLDWIDE.

*) As of October 2008, you can find a continually updated overview at:

The never-ending OTT success story.



THE OTT MEMBRANE TUBE DIFFUSERS ENSURE UNIFORM FINE-BUBBLE AERATION.

Between 1985 and 2008, over 2 million OTT membrane tubes have been installed in more than 5,000 municipal and industrial wastewater treatment facilities worldwide.

OTT diffusers allow economic operation with high reliability and easy, low maintenance. Our clients value these benefits.

Some of our successes are Olympian in stature.

1985	Development of the first OTT membrane tube diffuser
1987	Patent for essential design features on the membrane tube
1989	First export of diffusers to Asia
1990	OTT comes top in qualifying for oxygen transfer-rate measurements, and wins the contract for installing Darmstadt's central wastewater treatment facility.
1992	Supply of the first aeration-system with pipe-works and assembly
1994	Development of the OTT MAGNUM® tube diffuser
1995	A world first: use of FLEXSIL® membranes (Dollbergen refinery)
1996	Patent for MAGNUM® tube diffuser
1997	Patent for the unique MAGNUM® ClipIn attachment
1998	Export of first diffusers to North America
1999	OTT HE® aerators achieve efficiency – unique in the world for tube diffusers – of 5.1 kgO ₂ /kWh [8.38 lb O ₂ /hp-hr] (Finsterwalde WWTP).
2000	Introduction of FLEXSIL® membranes in municipal WWTPs.
2002	OTT diffusers fitted to the 5,000 th wastewater treatment plant
2003	OTT MAGNUM® diffuser with membranes of 48 km (almost 30 miles) in length fitted to one of the world's largest wastewater treatment plant in Bangkok
2004	The 2,000,000 th OTT diffuser is supplied. Equipping of the 500 th wastewater treatment plant in India OTT won oxygen transfer-rate measurements and material-tests as part of contract tender – at Hoechst Industrial Park in Frankfurt. Award of the contract for equipping Europe's biggest industrial wastewater treatment plant with the OTT MAGNUM® diffuser – BASF Ludwigshafen
2005	OTT receives accreditation from the Japanese government's testing department in Tokyo for installing diffusers in municipal treatment plans.
2007	Oxygen transfer rate tests according to the US standard at ATC Barcelona confirm the extremely high performance of the OTT MAGNUM® diffusers: SOTE 47% or 13%/m [almost 4%/ft] or 38.5g O ₂ /Nm ³ /mID
2008	Installation of energy saving OTT HE® aeration systems in the large WWTPs of Hamburg, Germany and Columbus, OH USA

“Leading edge technology” will no doubt strike you as a familiar phrase.

First-class German engineering is standard in our designs.

OTT offers process optimisation and complete aeration systems, pipework and lifting devices of outstanding quality. Our system solutions integrate our many years of extensive experience with materials.

We offer top quality and reliability, right down to the smallest detail.

This promise applies equally to our products and to your collaborative work with OTT.

OTT can build it all.

OTT also offers cost effective technical solutions for the conversion, expansion and retrofitting of existing aeration systems.

For the best “total aeration experience.”

Our membrane tube diffusers transfer oxygen in any aerobic process: activated sludge and pre- and post aeration, digesters; even specialty applications such as ozone, pure oxygen and others. All benefit from the outstanding performance of the diffuser design and membrane materials.

OTT diffusers are used in all areas of wastewater and water aeration, whether in sequencing biological purification procedures, in the smallest and the largest industrial sites, or in new construction and retrofits for municipal wastewater treatment facilities.



HANAU WASTEWATER TREATMENT PLANT: AERATED WITH OTT MAGNUM® FLEXSIL® HE® MEMBRANE DIFFUSERS

We have reinvented the tube-diffuser ten years ago.



LATERAL CUT OF MAGNUM® DIFFUSER

Where technology is concerned we strive to be at the leading edge.

For more than two decades, OTT has gathered an extraordinary wealth of experience in fine bubble aeration for special effluents, and has continued to develop its membranes and diffuser design on an ongoing basis.

Today OTT is highly successful in using tube diffuser membranes made of a proprietary silicone-based compound formulated especially and exclusively for OTT under the brand name FLEXSIL®. Originally developed for demanding industrial treatment plants, operators of municipal treatment

plants benefit from the extraordinary features of FLEXSIL® membranes. FLEXSIL® has become the industry's cutting-edge technology and, due to its commercial and technical advantages, has largely replaced other membrane materials. Product characteristics developed and, in some cases, patented by or unique to OTT, are a guarantee of long-lasting and efficient diffusers. If you compare us with any competitor product, you will soon see that OTT is clearly superior.



Stainless steel pinch clamps

Extra membrane material is provided to fold over the clamp for personnel and membrane protection a detail still unique to OTT.

Membranes

FLEXSIL® or FLEXNORM® Tubular membranes are optimally tailored to the type of wastewater and application. The highest quality standards and extensive QA/QC checks ensure continual high performance and reliability.

Fold-free membrane

The patented moulded profile of the OTT core tube guarantees the membrane is fold-free whenever process air is switched off, especially in intermittent operations. This primary and unique detail is the basis for a high degree of mechanical integrity and durability of membranes.

Perforation

The OTT perforation technique delivers an optimum bubble pattern. This method is but one of many features that give OTT diffusers unrivalled efficiency. The efficiency of OTT diffusers has been proven by the results of numerous independent performance tests. The perforation of the membrane can be geared to plant-specific requirements – just talk to us.

Single piece construction

The MAGNUM® diffuser is a single piece, injection molded membrane support tube made of virgin, recyclable polypropylene (PP). The structure and design make the MAGNUM® core a unique product. Environmental sustainability of your plant is enhanced by using recyclable, environmentally inert materials. Quality is maintained by the computer controlled production.

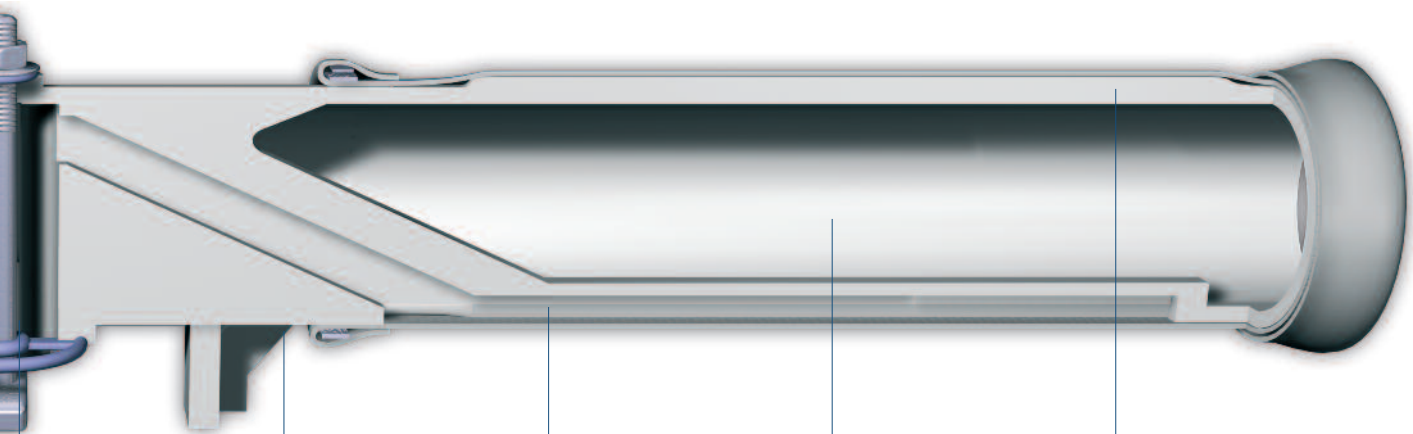
Nothing can replace high quality – except higher quality.

Yet again: the small but distinct difference . . .

OTT has a membrane in its range to suit every need. When you share details of your application, we give comprehensive advice, using our extensive experience, gained from diverse requirements for all types of plants and sectors of industry to assist you in your membrane and perforation selection. We ensure your selection is the optimum in every instance.

You can rest assured:

The membranes used by OTT have been developed in close collaboration with leading elastomer producers and scientific institutes. The membranes and raw materials undergo many quality checks throughout the whole supply chain, in line with the DIN ISO 9000 standard. They are also tested and inspected at several stages in our own laboratory.



CLIP IN®

The patented CLIP IN® locking bolt makes the MAGNUM® the easiest and quickest diffuser to install available.

Mounting socket

MAGNUM® diffusers are available in a range of different connector dimensions. Mounting on both square and round piping is equally possible.

Air channel

Injection molding of the diffuser makes it possible to incorporate the air channel on the underside of the membrane support tube. The air channel evenly distributes air between the support tube and membrane. This yields a consistent bubble pattern even at low air flux rates, giving a clear edge over any competitor products.

Flooded tube

The membrane support tubes of the MAGNUM® diffuser core are open at the ends and in the center. Thus, the diffuser's buoyancy is minimized.

Lengths

The MAGNUM® is available in effective membrane lengths of 1,000, 1,500 and 2,000 mm. The overall diffuser length is 200 mm more in each case.

The OTT HE® system: good for our environment and best for your balance sheet.



Quite naturally efficient.

Up to 70% of a treatment plant's energy consumption is used for oxygen supply to biological processes in the aeration tanks. Over the last decade, the HE® system has demonstrated savings of up to 30% of energy costs for aeration compared with conventional systems. Many of our clients achieve savings of 0.30 € - 0.50 € (\$0.45 - \$0.75) per population equivalent (PE) per year. Considering the HE® system for your next project or existing, inefficient operation will be worth your while.

So far about 10 million € (\$15 million) have been saved by using the HE® system in municipal and industrial treatment plants. This corresponds to energy savings of around 100,000 MWh, and a corresponding reduction in CO₂ emissions of approximately 59,000 tons.



GÖTTINGEN PLANT: OTT HE® AERATION SYSTEM

The **HIGH EFFICIENCY** (HE®) system

High-performance membranes made of FLEXSIL® and a computer-simulated aeration layout guarantee process stability in the aeration tanks. The HE® system is equally suitable for newly constructed and converted facilities. All system components are proven through years of use.

Capital assets up, energy costs down: that figures!

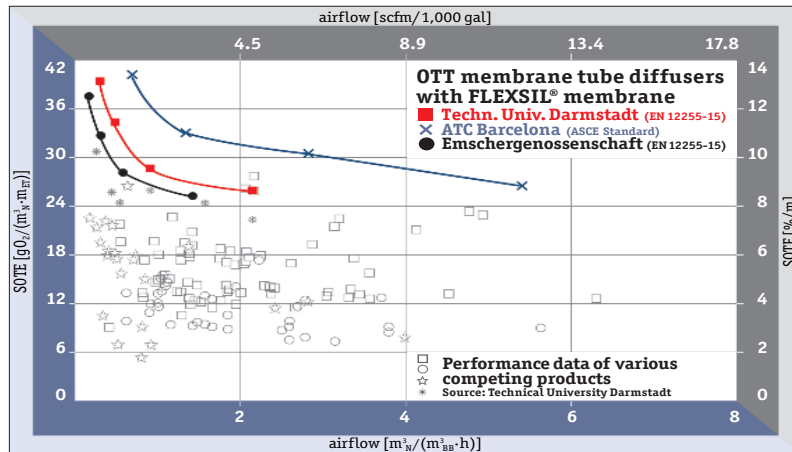
The HE® system saves energy costs through highest oxygen transfer rates with very low air flow. It therefore lowers investment costs via smaller blowers, and reduced pipe cross-section. Existing facilities can be enhanced without upgrading of blowers.

The HE® system will give you compelling financial and technical advantages while protecting the environment at the same time. Ask us to calculate the savings potential as applied to your own plant, and draw up a precise economic viability report with individualised payoff calculation.

To whet your appetite, just take a look at the next page.

OTT System. Tests show it's one of the best.

OTT aeration systems: **highest** performance and **lowest** energy consumption.



TESTING PLANT AT HOECHST INDUSTRIAL PARK

And another thing or two:

After a nine-month, maximum-usage trial period at the Hoechst industrial park, OTT came out top in the test ahead of all European competitors.

»And the winner is:«

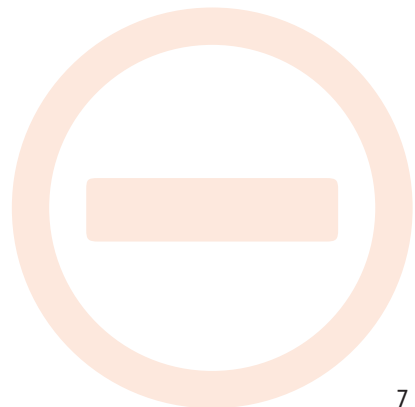
In addition, at performance measurements in Bremen and Darmstadt, and for the selection in Hamburg, and also in Tokyo, OTT came out top.

Why not decide for yourself:



The clearly superior system

- + top efficiency
- + first-class references
- + tried and proven for municipal and industry effluents
- + simple installation
- + quicker payoff
- + reduced carbon footprint
- + environmentally sustainable



It was crystal clear at Langenhagen sewage treatment plant.



OLD: COUNTER CURRENT AERATION SYSTEM



NEW: FULL FLOOR COVERING, EFFICIENT
OTT HE® AERATION

No one likes waste.

The operators of Hanover's Langenhagen treatment plant chose to use an HE® system for their conversion works. Previously a counter current aeration system had been in use.

With OTT, everything is reduced: installation and operating costs as well as environmental impact.

The results are evident. We've got the proof in black-and-white from Darmstadt Technical University.

Due to the outstanding performance of the HE® system, savings of over 50,000 Euros (\$ 75,000) per annum could be achieved in Hanover-Langenhagen. That's well over 0.50 € (\$ 0.75) per PE compared to the old aeration system.

We can also calculate it differently for you: ecologically.

Compared with the previous system, installing an HE® system has led to

annual electricity savings in Hanover-Langenhagen of around **554,000 kWh**.

This is equal to the annual consumption of over **120 households**, thus avoiding approximately **267,860 kg [~ 300 tons] of climate-damaging CO₂** emissions per year (not to mention other toxic substances).

To absorb this amount of CO₂, a total of **24,350 spruce trees** would have to be planted.

To produce this 554,000 kWh of electricity by alternative means, say solar energy,

5,000 m² [~ 54,000 ft²] of solar cells

would have to be installed, based on sunshine levels in Germany.



This would involve an investment outlay of about 3 million € [~\$ 4.5 million].

With OTT everything comes out lower in capital and operation costs.

OTT systems come with the best, global recommendations.

We encourage you to check our references.

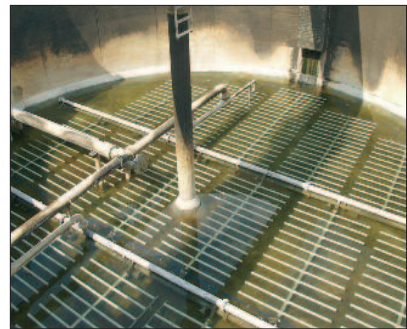
In recent years, to an increasing extent across the globe, municipal and private operators of treatment plants, industrial plants and projects in which water aeration plays a prime role, have been choosing OTT tube diffusers. We would like to introduce a few of them to you here. We believe you'll be interested.



OTT MEMBRANE TUBE DIFFUSERS AT HOECHST INDUSTRIAL PARK, FRANKFURT AM MAIN

OTT tube diffusers in industrial plants.

BASF, Shell, McCain, ARLA Foods, Orlen, BAYER, CocaCola, Nestlé, Hochland, Miller Brewing, MEWA, Škoda, RWE, Remondis, Friesland Dairy, Smithfield, Wrigleys, Henkell, Washtec, Ruhrzink, Stora Enso Paper, UPM, Infracore, Sasol, BioKyowa
... and many more.



STP BAYER GLOBAL, CHEMICAL INDUSTRY, ROUND TANK

OTT diffusers in municipal treatment plants.

Bangkok, Moscow, Tokio, Dubai, Tripoli, Hamburg, Hanover, Kassel, Göttingen, Mainz, Jena, Dry Creek/KY, Columbus/OH ... more than 2,000,000 OTT tube diffusers have been installed in over 5,000 treatment plants worldwide since 1986.



SEWAGE TREATMENT PLANT IN MOSCOW, RUSSIA

OTT tube diffusers – other interesting uses.

- floating aeration in lagoons
- aquaculture and big aquaria
- deep basins (over 9 m [~30 ft]) with high air temperature
- compact plants on cruise ships
- aeration in drinking water purification



HOECHST NIVA: MAGNUM® ON PP PIPEWORKS

And let's just mention that... we will be pleased to send you, on request, oxygen transfer-rate measurements by independent institutes and expert reports on projects mentioned here.

OTT. The one for all. On the one hand:



The fact that OTT supplies only the very best obtainable tube diffusers is the prime thing to consider.

OTT should be your first port of call when considering the oxygen supply and biology of water and wastewater.

Proven high-performance and extremely economic OTT aeration systems can now be found in most of the world's countries and in many areas of application.

OTT aeration systems for municipal wastewater purification.

- Activated sludge plants
- Sequencing Batch Reactors
- Moving Bed Biological Reactors
- Sludge digester tanks
- Sedimentation tanks

OTT aeration systems for industrial effluent purification.

- Paper factories
- Petrochemical plants
- Pharmaceutical plants
- Chemical plants
- Food processing
- Drinks / Dairy
- Meat processing
- Leather tanning
- Dye works
- Rendering plants
- Landfill leachate treatment

OTT aeration systems for special industrial use.

- Galvanotechnology
- Stripping gases
- Mixing fluids

OTT aeration systems for water aeration.

- Drinking water
- Fish breeding
- Ponds
- Rainwater reservoirs

OTT. The one for all. And on the other hand:

But you don't have the full picture. OTT offers more.

The fact that our company has developed into the market leader in »aeration technology« means that we have responded to the demands of an increasingly demanding market, decisively expanding our business fields and thus the OTT area of competency.

We call this – simply and modestly – the OTT growth strategy.



OTT-INTERNATIONALLY WELL-POSITIONED

**OTT is now on the way to being
a major project developer in
wastewater treatment technology.
Locally, nationally, globally.**

There's probably no need to mention that we are guided here too by the holistic OTT company philosophy and our own intrinsically high standards.

It is this after all that has so far given us the unique and distinctive position we occupy in this product field.

But let's say it again anyway. . .

No matter whether the difficulties you're experiencing in your wastewater treatment are product- or process-related, at OTT we'll resolve this for you. Collaboratively.



AT OTT WE CALL THIS THE "OLD WAY OF DOING THINGS."

OTT offers more. We are your expert partner when it comes to realising your construction, conversion and improvement projects in the field of wastewater aeration technology.

We will draw up plans according to your requirements, generate precise perfor-

mance data for you speedily, and present carefully developed layout proposals to you. Our engineers will supply you with tailored plans based on many years of successful experience with these projects.

OTT will accompany you from initial planning through to operation-ready hand-over of the completed facility. It is always reassuring to know you have a strong partner by your side.

OTT.
Synonym for the most up-to-date wastewater treatment technology.



AT OTT EVERYTHING INTERACTS. THAT TOO PUTS US IN A CLASS OF OUR OWN.

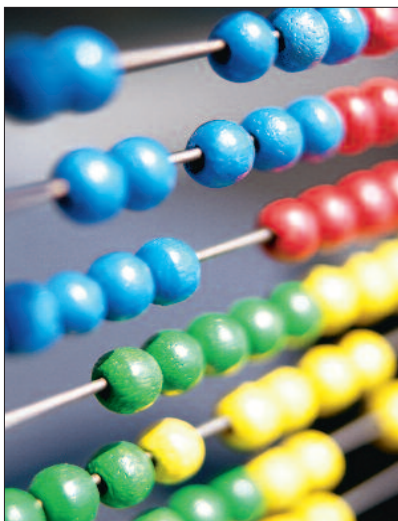
With OTT you get everything you need to make your project a success:

- **Planning and project development**
- **Project management**
- **Engineering**
- **Technical design**
- **Pipework construction and assembly**
- **Maintenance and service**
- **Renovation and upgrades**
- **Energy-saving improvements**
- **Financing plans**

We don't just talk about it, we also know how to do it.

It's evident, after all, that a company which offers the whole service can plan things better; can apply its own high quality standard to all sectors of the overall project, profiting from rationalisation effects and synergies achieved thereby, and thus markedly enhancing products, planning and processes.

Remember that lovely proverb? »The whole is more than the sum of its parts.« Precisely.



Without OTT, your aeration facility installation may cost you dearly. In every sense.

In direct competition with rival national and international contenders, we have often enough demonstrated our superiority. So when deciding on »the winner« please don't just think of it in racing terms but also with an eye to the ensuing costs of your project - before you spend vast sums on longterm energy bills, and put undue strain on your profits.

We will show you very persuasive savings potential in relation to your plans. Guaranteed. After all, you can calculate too. And spare a thought for our environment as well. We only have one.

YOUR FINANCIAL CONTROLLER WILL BE PLEASED TOO . . . As Jules Verne said back in 1870: »Water is the coal of the future.«

So now you know a great deal about OTT. But what about servicing?

Although OTT is a German company, we are quite at home with the business English terms “pre-sales consultation” and “after-sales service”

In recent years OTT has organised workshops relating to aeration technology and energy-saving measures for wastewater treatment plants. These workshops have been very well attended by decision-makers, operators and construction companies. The mix of the participating group always ensured stimulating discussion following the specialist presentations. In future too, we will continue to hold these workshops or »OTT aeration conferences«, and will invite you to attend these when scheduled in your area.



HARD TOOLS & SOFT SKILLS IS THE WATCHWORD AT OTT.

Find OTT on the internet.

For years we have been using the internet as communication platform to contact our clients at any time across the globe. But above and beyond that, they can also, for instance, download datasheets or assembly instructions, and calculate aeration system design and layout.

On our website you'll also find all the addresses of our international offices and sales partners, and access their websites by direct link. Here too, you can request useful information by email.

We offer an online aeration simulation program for consultants and planning departments.



YET ANOTHER SOURCE OF INFORMATION

OTT has the right answer to every question. Just try us out!

Whether you're looking for a comprehensive system solution in the wastewater treatment field, or have a complex project enquiry, or maybe just an important question about some specific detail, give us your attention and trust.

OTT will reward it every time.

That's our promise to you.

Do take this personally for once: The direct route to OTT.



YOU'LL FIND A WARM WELCOME AT OTT IN HANOVER-LANGENHAGEN.

And form an idea about us.

Get to know the strengths of an outstandingly successful, medium-sized and proprietor-led company. See the technological superiority of our products for yourself. Immerse yourself in our company's special atmosphere and team spirit, and meet the OTT team in person.

Then you'll see why OTT has not only become the market leader in Europe but has also developed inexorably into a global player.

We look forward to your interest, and are sure that we can realise your particular project too – in our usual way.

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Member of

**German Water
Partnership**

And the question I keep meaning to ask OTT...

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