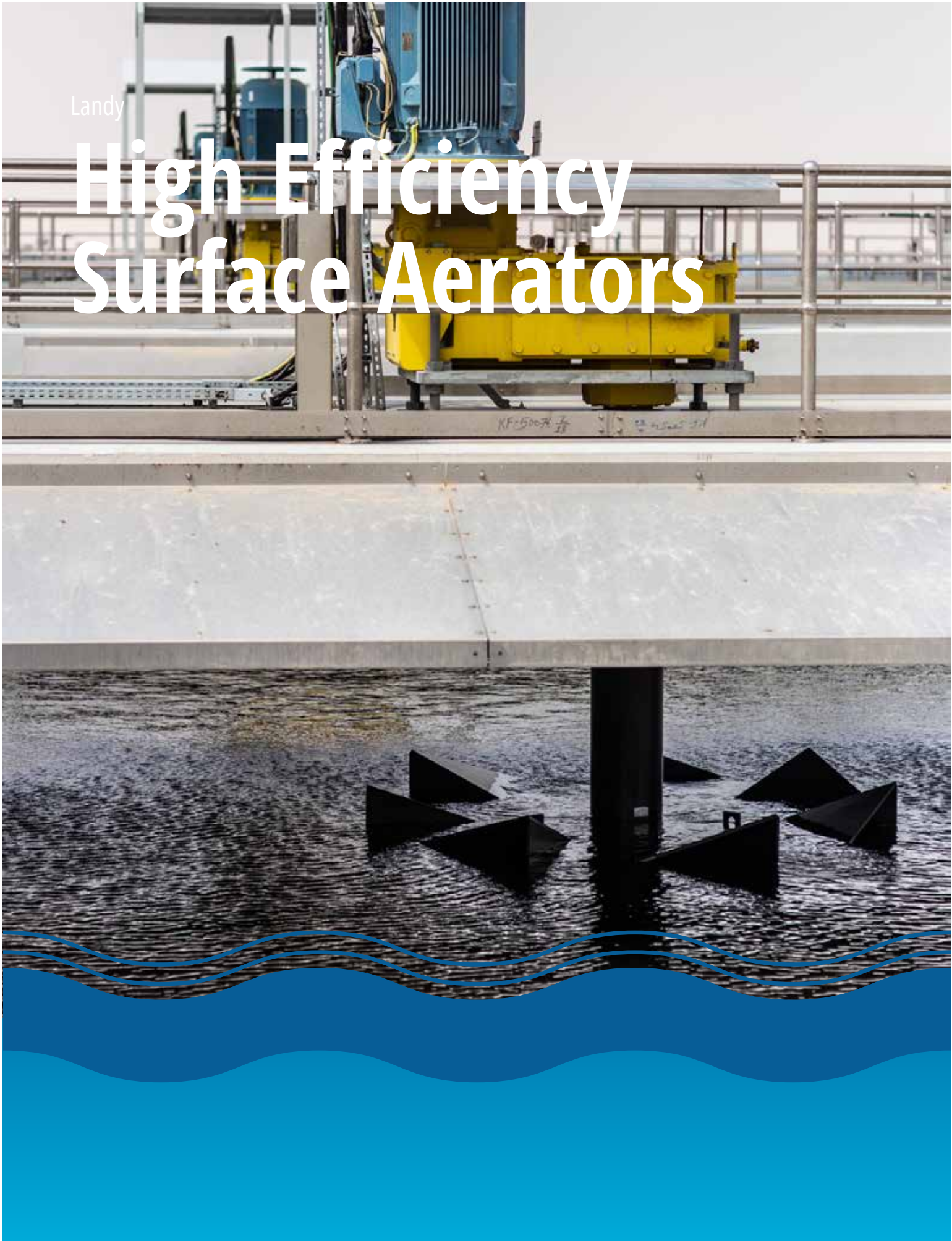
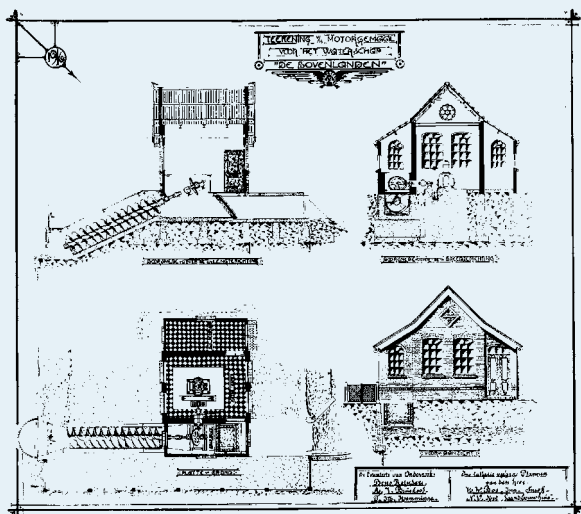


Landy

# High Efficiency Surface Aerators





## OVER 100 YEARS OF HISTORY

- In 2013 Landustrie celebrated its 100th anniversary.
- The foundations were laid around 1913, when the company was active in the agricultural sector and the evolving phases of polder drainage. As early as 1916, electrically driven pumping stations were installed with Landustrie Archimedes screw pumps alongside countless wind driven pumping stations. Screw pump design progressed rapidly and in addition to the polder drainage pumps, a range was developed to handle sewage. By the 1950s these advances contributed to wastewater purification units being used widely and efficiently.
- Today, Landustrie is a state of the art manufacturing and engineering company, combining traditional proven products and techniques, with high-tech innovations.

## LANDY surface aerators

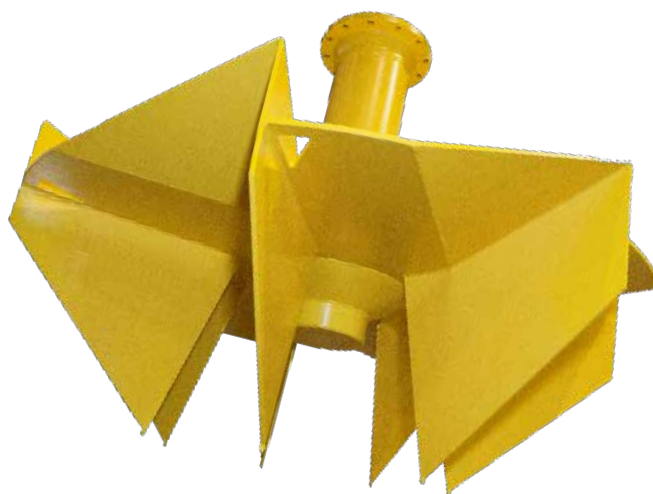
Landustrie is the world's leading solution provider for wastewater aeration. Landustrie has extensive knowledge and experience, and a strong historical track record in this field.

For more than 50 years Landustrie has designed, manufactured, supplied, installed and maintained fine bubble aeration systems as well as surface aeration systems including low speed surface aerators and brush aerators.

As a prominent manufacturer of innovative, durable, highly efficient, and cost effective low speed surface aerators, Landustrie has developed the LANDY "axial flow" low speed surface aerators. These are characterised by high and consistent aeration efficiency over a wide range of speeds and immersion depths.

Further, the LANDY system is known for outstanding mixing, ensuring a complete and homogenous mixture throughout basins with up to 5½ m water depth (without draft tube) and exceptional propulsion when used in an oxidation ditch.

Turbine of LANDY-7 surface aerator



## Sustainable solutions

By supplying low speed surface aerators that enable the highest possible aeration efficiency and having a service life up to 30 years, Landustrie provides highly sustainable solutions contributing to lower energy consumption.

This results in a reduction of the carbon footprint and lowest possible total cost of ownership. Landustrie helps you achieve a truly sustainable process by combining many years of aeration engineering experience with professional project guidance throughout the entire process.

Processing costs are kept low by Landustrie specialists providing expertise from conceptual design through commissioning and start-up, thus ensuring environmentally friendly, sustainable and economically viable products.

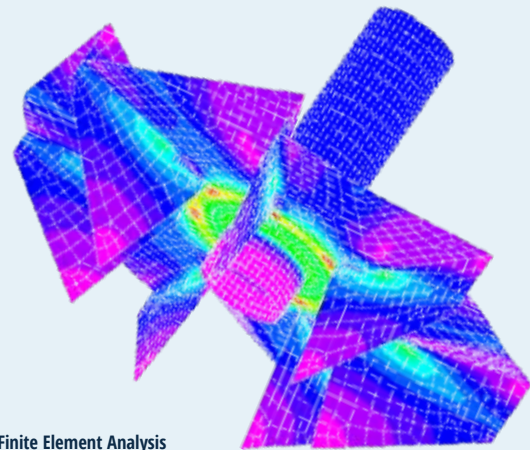


Activated sludge process with LANDY surface aerators

## Aeration in general

Wastewater aeration is the process of adding air into wastewater to allow aerobic bio-degradation of pollutants. The activated sludge process is the most common option in wastewater treatment. Aeration in an activated sludge process is based on transferring atmospheric air (primarily O<sub>2</sub>) into a liquid filled basin, promoting the cultivation and reproduction of micro-organisms which carry out the treatment process by breaking down organic matter.

Aeration also re-establishes dissolved oxygen levels in the final effluent in order to sustain plant and animal life when discharged into rivers and lakes.



Finite Element Analysis

## Selection

The LANDY “axial flow” and state-of-the-art 4th generation low speed surface aerators provide the highest and most consistent aeration efficiency over a wide range of speeds and immersion depths, resulting in lower power consumption and higher and more controllable oxygen input. In addition, due to the unique conical shape, unparalleled pumping action is achieved.

This guarantees a complete mix throughout the basin for up to 5½ m water depth. At water depths up to 8 m, draft tubes can be used with the surface aerator, maintaining the same high efficiency and operational benefits. The virtual cone shape of the LANDY low speed surface aerators enables outstanding propulsion when installed in oxidation ditches and makes the surface aerator clogging-free and self cleaning.

Low speed surface aerators from other brands are typically of the “radial flow” type, not featuring the operational benefits of the LANDY surface aerators. “Radial flow” type surface aerators therefore cannot be considered as present state-of-the-art.

Once dimensioned with our proprietary software, Landustrie engineers utilize finite element analysis (FEA) software for calculating all of the stresses which occur on the surface aerator and support member. This ensures a simple and robust construction of the surface aerator with the least possible material thickness. This is true for both the carbon steel epoxy coated option as well as the stainless steel option in either AISI 304 or AISI 316. If necessary, an intermediate flange can be fitted into the aerator shaft in order to ease-up packing and reduce transport costs.



## Research & Development

Even though Landustrie builds the most durable and efficient low speed surface aerators in the world today, we never rest. We have our own in-house full scale test basin where we are able to develop new ideas into tested and proven products.

In terms of volume (2.200 m<sup>3</sup>), water depth (5½ m) and testing possibilities, this test basin is one of a kind in the world. In the basin, a height-adjustable bridge is installed in order to be able to simulate lower water depths.

The basin volume may be reduced by inserting extra walls in the basin. The foundation plate of the drive-unit is flexibly mounted, and provided with 4 measurement probes using strain gauges to measure the radial and axial forces. The measured value of the axial and radial forces, the torque, and the oxygen content is monitored by data loggers.

Aeration tests are executed according to European and German standards: EN 12255-15 and ATV M209 E. The rise in oxygen content is measured by 4 oxygen probes.

Vibration, noise level and water flows can also be measured.

Besides measurements for our own use, 3rd party validation tests can also be carried out, which may be witnessed by the customer and end-user. Each LANDY surface aerator is tested in this test basin under various conditions. Landustrie therefore is capable of accurately predicting the aeration efficiency under prevailing on-site conditions.

The end result? The surface aerator we design and build for you will perform as expected thanks to many years of experience and in-house development and testing.

In addition to the full scale test basin, Landustrie also has a small test tank which can be used for customer specific  $\alpha$ -factor determination.



Robot welding of LANDY surface aerators

## Manufacturing

To ensure the absolute highest quality product, we manufacture all of our LANDY surface aerators at our factory in Sneek, the Netherlands. The factory is equipped to manufacture surface aerators in a wide range of diameters from 1 – 250 kW installed power.

At our 15.000 m2 state-of-the-art manufacturing facility, we have all of the latest technology to build the most durable and efficient low speed surface aerators currently available. From metal forming and welding, to corrosion protective coatings and painting, and through

to the final assembly, each step of the manufacturing process is under our roof and importantly, under our quality control programs.

For example, in our facility we X-ray and/or perform ultrasonic tests in critical areas to further ensure your surface aerator will be a robust and reliable system for decades to come.

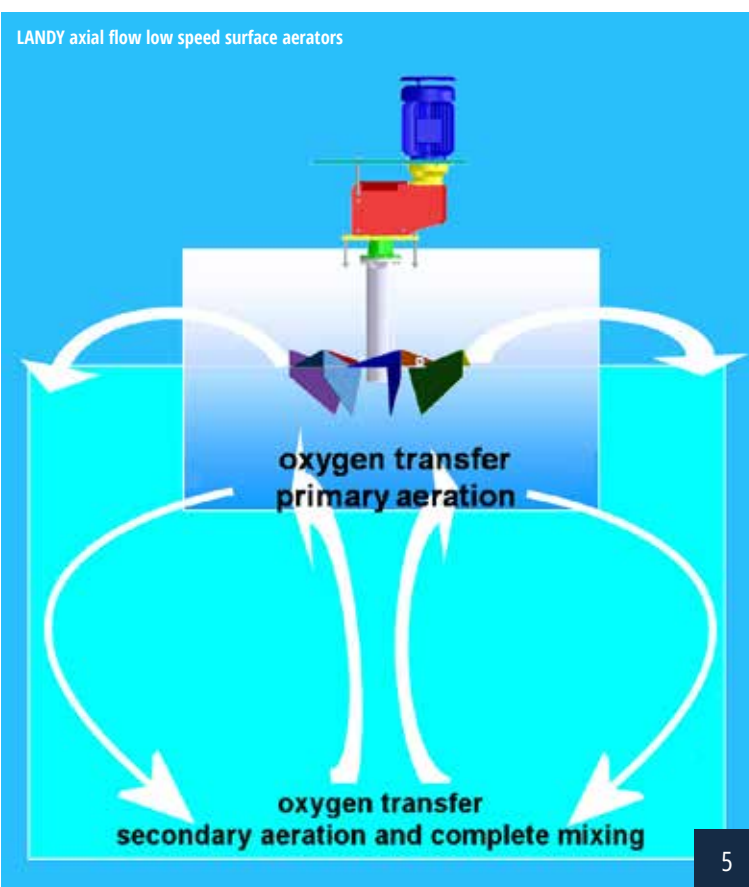
Landustrie has earned and operates under ISO 9001-2008 and SCC (Safety Checklist Contractor) certifications.

## Operation

Like other surface aerators, the LANDY “axial flow” high efficiency surface aerators provide oxygen transfer to wastewater of municipal or industrial origin: the “primary aeration”.

However, they stand out from other surface aerators by its virtual cone shape, pumping up water from the lower parts of the basin. Water reaching the surface has a high oxygen deficit making oxygen transfer fairly easy. As a consequence of the unique conical shape, a complete mix throughout the basin of up to 5½ m water depth is ensured (or even 8 m with draft tube), enabling a homogenous mixture of the solids. At the same time, oversaturated water at the surface is mixed with oxygen-deficient water from the lower end of the basin: the so-called “secondary aeration”.

This mechanism is achieved only with “axial flow” surface aerators and explains why the aeration efficiency of LANDY “axial flow” surface aerators is better than any other surface aerator.





## Applications

The LANDY high efficiency surface aerators have their most important application in aerobic biological wastewater treatment, providing adequate dissolved oxygen to the biological process while ensuring a complete mix throughout the basin and (where needed) appropriate propulsion.

They can be installed in either a fixed or a floating arrangement, and in many types of basins. The options for installing the LANDY surface aerator in a basin are virtually limitless. For providing mixing, aeration and (where applicable) propulsion they can be installed in rectangular, square or round aeration or sludge stabilization basins. The basins may be shallow or deep (if necessary with draft tubes), oxidation ditches, MBR- and SBR-systems, lagoons, ponds, mixing or buffer basins.

The LANDY surface aerators are widely used while maintaining their unparalleled high aeration efficiency.

Other important uses of the LANDY high efficiency surface aerators are in the pulp and paper industry and in the sugar-alcohol industry. Depending on the application, the LANDY surface aerator may be installed in a classic aeration basin or in conjunction with an anaerobic bioreactor, in either case it is up to the task.

The state-of-the-art floating arrangement consists of a platform and two parallel beams, sized to suit the particular surface aerator. This achieves a more compact installation, which is more stable under operating conditions.

Further, this arrangement is much easier to trim and, allows for easier, more efficient and cost-effective packaging and transport. For a small spot license fee, the floating construction might be manufactured locally according to the Landustrie design if so desired, allowing the use of less expensive local labour and removing the packaging and transport cost.



LANDY floating surface aerator



LANDY surface aerator at rectangular basin



LANDY surface aerator at oxidation ditch

## Highest & most consistent efficiency

LANDY “axial flow” high efficiency surface aerators are the world’s most efficient surface aerators, reducing energy consumption up to 20% while ensuring a complete mixture.

They achieve the highest aeration efficiency over a wide range of speeds and immersion depths. The actual efficiencies that can be obtained with LANDY high efficiency surface aerators depend on a number of factors, including geometry of the basin, climate conditions, temperature and altitude.

An important advantage of surface aerators is that the efficiency is constant over the full lifetime of the aerator, which can reach up to 30 years with proper maintenance. LANDY high efficiency surface aerators are able to achieve the following figures when installed in:

- oxidation ditches:** 2.2 – 2.5 kg O<sub>2</sub>/kWh
- rectangular basins:** 1.8 – 3.3 kg O<sub>2</sub>/kWh
- lagoons:** up to 2.0 kg O<sub>2</sub>/kWh

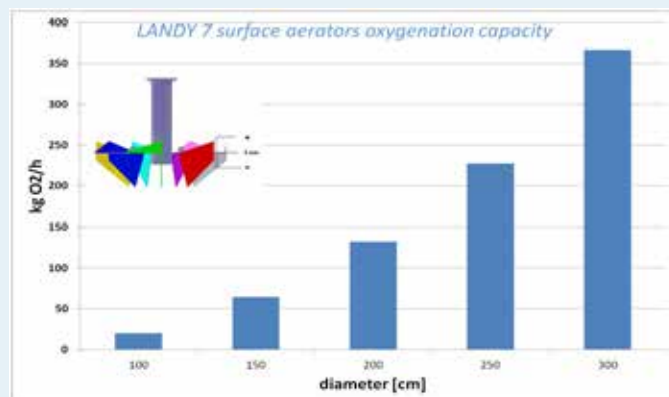


## No dead zones

Due to the uniquely shaped blades, the LANDY surface aerators induce an axial flow in the aeration basin which ensures a perfect complete mix of the incoming wastewater, the mixed liquor suspended solids (MLSS) and the oxygen.

## Wide range of oxygenation capacity

Subject to the conceptual design, LANDY high efficiency surface aerators are able to transfer up to 550 kg O<sub>2</sub>/hr into the wastewater. For any specific LANDY surface aerator, the range of oxygen transfer is very large while its aeration efficiency is constant over a wide range of speeds or immersion depths.



Oxygenation capacity against diameter

## Gradually increasing power curve

The LANDY “axial flow” high efficiency surface aerator stands out because of its gradually increasing power curve. Both oxygenation and absorbed power are a function of the immersion depth, and increase slowly at larger immersion depths, allowing for a more flexible process sequence. This is in contrast to “radial flow” surface aerators, where a minor change in immersion depth results in a major change in power draw, which leads to a larger tripping risk of the motor drive.

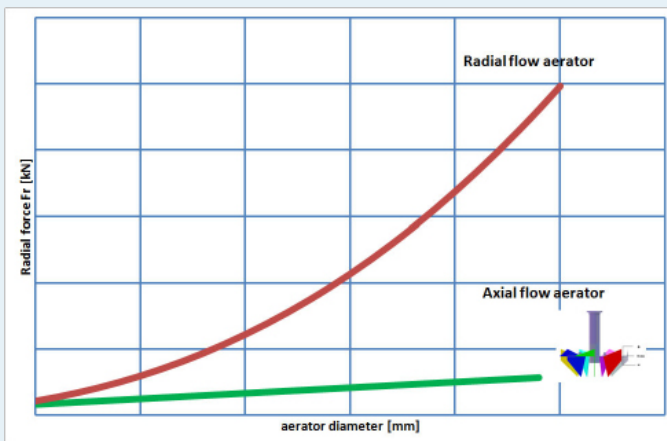
This unique shape is the source of the pump function, guaranteeing a complete mix throughout basins up to 5,5 m water depth. The oxygen is evenly distributed across the full basin. Thus sedimentation and dead zones are eliminated!



## Lowest radial & axial forces

The design of the LANDY “axial flow” high efficiency surface aerators is such that both the radial force and the axial force are much lower than with any other surface aerator. In particular, the forces on the support bridge are far lower.

The lower radial force reduces the bending torque on the bearings of the outgoing aerator shaft, which results in a less heavy-duty and more cost-effective gearbox that can be selected. In addition, vibration characteristics are reduced significantly. As a result, critical vibrations in the gearbox do not occur, increasing the gearbox lifetime.



Lowest radial force with LANDY surface aerators

## Simple and robust

Landustrie guarantees simple and robust construction with the least possible material thicknesses by utilizing finite element analysis (FEA) software. This is performed for any steel grade from which the LANDY surface aerator is manufactured.

As a result the forces on the gearbox bearings are reduced to a minimum, while the forces applied on the surface aerator are very low due to the unique shape of the impeller. The odd number of blades makes the surface aerator run more smoothly than any other surface aerator.

## Self cleaning & non-clogging

The virtual cone shape created by the 7 blades makes the LANDY high efficiency surface aerators self-cleaning and non-clogging. As a result of this shape it's impossible for any rag or other detritus to attach to the impeller.

## Quiet

Any operational surface aerator produces water splashing and causes noise. Some of this noise originates from the mechanical drive (~20%), but most originates from the splashing of the water (~80%).

The strength of a well designed aerator is achieved with a controlled splash pattern, another area in which the LANDY high efficiency surface aerators stand out from other surface aerators.

If a LANDY surface aerator would be subject to further restrictions regarding water splashing or noise, Landustrie is able to supply provisions for noise suppression as well as devices to reduce water splashing (such as the Aerocap).



Less water splashing and noise suppression



## Consulting engineers

Low speed surface aerators can often be deployed more efficiently and effectively. A substantial amount of energy can be saved when the operation of the aerator is based on the real load of a treatment plant and not on the original design parameters.

Precise adjustment is very important in view of the fact that about 80% of the electric power at a wastewater treatment plant is consumed by aeration. At the design stage of a wastewater treatment plant, process calculations are based on the maximum load of the plant, including a projection of growth for the coming years. The number of aerators and their conceptual designs are based on those initial figures.

But what happens when the actual load is much less than anticipated load, or when the circumstances are very different from those originally assumed?

By adjusting the aeration system to the actual plant load, the aeration efficiency can be improved considerably.

This allows for energy savings as high as 30%, resulting in reduction of usage costs and consequently a reduction of the carbon foot-print.

Landustrie has developed a toolbox to diagnose the operation of surface aerators against the actual load of a treatment plant.

The final objective of this scan is optimization of the aeration process, thus improving efficiency and durability. Sometimes it's desirable to retrofit an existing aeration system.

In any event, Landustrie the ideal partner to provide you the best technical and economic advice.

## Experience

Landustrie has been involved in aeration technology for more than 50 years in more than 60 countries worldwide.

This has given Landustrie the knowledge and experience to design well functioning aeration systems, as well as to optimize existing aeration systems.

Our experience varies from providing one small surface aerator to providing large scale projects and anything in between.



## Installation & commissioning

The Landustrie teams are renowned for the quality of work in the field. Under any condition, the installation and maintenance teams are able to deliver high quality and fast solutions. On-site tuning to your specific site characteristics is one of the skills of the team.

The LANDY surface aerators can always be installed by our specialised installation team.

Another option is the use of a Landustrie supervisor, who will ensure proper installation of the surface aerators together with a local team.

Our supervisor can also be called upon for commissioning and start-up of the surface aerators to ensure optimum performance and long service life.

## After-sales services

Landustrie's after sales service is your connection to Landustrie, not only for spare parts but also for training, supervision of installation, commissioning or start-up.

For more information:

[aftersales@landustrie.nl](mailto:aftersales@landustrie.nl)

## Maintenance

Landustrie can provide both preventive and, if required, corrective maintenance for the surface aerators. Furthermore, spare parts are easily available and can be quickly dispatched to your site for maintenance, ensuring that the all-important up-time of the surface aerators is achieved.

The knowledge of the manufacturing process and decades of experience designing, operating and maintaining surface aerators makes Landustrie the clear choice to provide full after sales support for any surface aerator.



# Over 250 years of experience in water handling and treatment

From water intake systems to water cooling, from water management to wastewater treatment, hydropower, pump installations, and award-winning innovations in decentralized wastewater treatment; DeSaH, Hubert, and Landustrie have joined forces. Based in Sneek, Friesland, our craftsmen develop and manufacture future-proof solutions with an above-average lifespan.

## **Landustrie Sneek BV**

P.O. box 199 | NL-8600 AD SNEEK, The Netherlands

Tel. +31 515 48 68 88

E-mail [info@landustrie.nl](mailto:info@landustrie.nl) | Website [www.landustrie.de](http://www.landustrie.de)

Office address Pieter Zeemanstraat 6, Sneek

