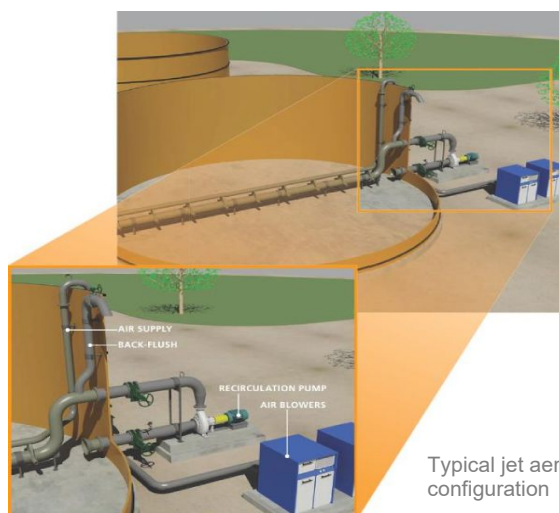


Jet aeration



Typical jet aeration configuration

Kerkhofstraat 33
2220 Heist-op-den-Berg - BE
Phone +32 (0)15 24 21 15
info@task.be
www.task.be

The most effective aeration system for deep basins

Jet aeration is a technique that has been used for more than a hundred years for bringing water and air into contact and for mixing applications. Especially in the last decades, the jet aeration technique has become more and more known and used in water treatment. Since 2006, the KLa Systems jet aerators that we use are equipped with a Slot Injector™ system with injection slots. This unique, innovative and highly efficient jet aeration system has already been used worldwide in various industrial sectors, such as the food industry, the beverage industry, the paper industry, the chemical sector and the waste processing sector.

Operating Principle

Traditional Jet:

The submerged jet aeration system mixes air with a fluid in motion and injects this stream into the wastewater. The aerator itself consists of two nozzles. The injection liquid - the recirculated liquid/air mixture - is sprayed from an inner nozzle into an outer mixing nozzle, where compressed atmospheric air is added and cut into very fine bubbles, which are carried into the liquid stream. When the liquid stream enters the existing water mixture, it forms a powerful water plume with high turbulence. The water plume sets the surrounding water/air mixture in motion by its force and brings it into contact with the fine air bubbles. All this results in a very high oxygen transfer coefficient. The system owes its effectiveness to the large interface between air and wastewater created by the very fine bubbles, to the high turbulence in the expelled water plume, and to the extended life of the fine bubbles.

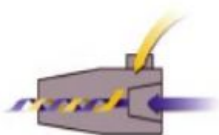
Slot injector

Based on the traditional jet nozzles, but uses a slotted configuration, in order to increase the efficiency of the system. The slotted nozzle and mixing chamber provide a larger interface for mass transfer than a similarly sized round jet nozzle

The Slot Injector's unique shape with injection slots provides a high percentage of dissolved air and a superior mass transfer coefficient.

A typical Slot Injector™ system consists of the aerators with injection slots, the piping inside the aeration basin, the backwash system, the dry mounted centrifugal pump, and the roots blowers. Connecting piping inside and outside the basin and the supporting fastening system for the jet aeration are made of stainless steel.

Traditional jet



Slot injector nozzle



Backwash system

A study by the Water Environment Research foundation shows that fine bubble aerators exhibit decreased oxygen transfer over time and require higher pressure, due to increasing clogging symptoms, and have the greatest setback within the first 24 months of operation. These fine bubble aeration systems in many cases require frequent cleaning and sometimes even need to be replaced within the first 5 years of operation. This is not the case with the Slot Injector™ systems with injection slots, thanks to their much larger openings and self-cleaning capability, which allows cleaning of the injection nozzles without having to empty or enter the basin. The Slot Injector system can be easily backwashed by sending the flow in the opposite direction through the inner nozzle, whereby the resulting powerful air/water flow removes all dirt and waste particles from the system. Slot Injector aeration systems are known for their long term reliable operation.

Optimization of existing installations - retrofit solutions

In the context of a production expansion and/or an optimization of the energy consumption, Task can also assist companies for the adaptation of an existing wastewater treatment plant. Most types of existing aerators, of course also all types of existing jet aerators, can be equipped with the Slot Injector™ system with injection slot, and this within the existing basins. In this way higher oxygen transfer coefficients (15-60%) can be obtained without having to replace the existing compressed air supply. On the other hand the Slot Injectors also allow to achieve the same oxygen content with a smaller air flow. The jet aeration system with Slot Injectors also provides a more dispersed operating range at peak loads, without compromising the mixing process. Upon request, we will be happy to review the specifications of your existing aeration system in order to propose a cost effective optimization with our Slot Injector™ system.

Features and benefits of the jet aeration system with slot injector slot

The Slot Injector™ aeration system is a superior jet aeration system, specifically suited for industrial scale biological water treatment applications, where a fine mesh screen system is part of the standard preliminary process, in both common activated sludge applications and advanced activated sludge applications. Industrial sectors that can certainly benefit from the use of Slot Injector technology include: the food industry, the beverage industry, the paper industry, the chemical industry, the pharmaceutical sector, the petrochemical sector, the textile sector and the waste processing industry (treatment of leachate water).



Saving energy costs and operational cost savings

The thrust of the jet in the Slot Injector aerator creates a zone of high negative pressure, maximizing the entrainment of gases. The mixing chamber of the jet aerator includes a pressure recovery zone, which distinguishes the Slot Injector from the traditional jet aerator. This feature allows the Slot Injector aerator to dissolve large amounts of gases in the water, and with significantly less pumping power. Like traditional jet aerators, the hydrodynamics within the Slot Injector aerator and the high-energy water plume that is produced ensure a continuous renewal of the aeration basin surface water, at the level of the liquid/air contact surface. All these factors together lead to higher alpha factor than traditional aerators. Compared to conventional jet aeration technology, the Slot Injector aeration system with injection slots offers some unique advantages :

Saving operational cost:

- Up to 60% less liquid flow rate leads to the use of smaller and/or fewer pumps, and smaller diameters for the piping, both inside and outside the aeration basin.
- The better gas dissolution results in a 15% reduction in required air volume, allowing the use of smaller blowers, motors, and/or piping.

Energy cost savings:

- The higher velocity of the jet aerator fluid plume allows the Slot Injector aeration system with injection slot to be placed at a greater distance from the bottom of the basin. This allows the blower to run at lower pressure, which obviously saves on energy costs.
- The pumping system under higher pressure, often allows 15% more hydraulic efficiency to be created.
- The concept of the Slot Injector aeration system with injection slots, together with a higher pressure pumping system, allows to optimize the aeration efficiency, by varying the air flow rate, as well as the fluid flow rate. At the same time, all basic mixing requirements of the process can be met.

Application area

The KLA jet aeration technology is applicable to a wide range of water treatment applications and sludge treatment, such as : Activated sludge, SBR (Sequencing Batch Reactor), MBR (Membrane Bioreactor Systems), CLR (Closed Loop Reactor), MBBR (Moving Bed Biofilm Reactor), oxidation ditches, aerobic (sludge) stabilization tanks, buffer tanks, aerobic sludge stabilization and Autothermal thermophilic aerobic digestion (ATAD).

Jet aeration systems in water treatment

In the past, submerged jet aeration systems were always conceived with nozzles mounted horizontally, usually no more than 30 cm above the bottom of the aeration basin. Consequently, blowers were required to counteract the static pressure, nearly equal to the total depth of the basin.

Today's jet aeration system is designed to be set up higher, typically 75 cm to 120 cm above the bottom of the basin. By mounting the nozzles at a higher height, significant savings can be realized, in terms of blower power, which of course is then reflected in the cost.

The jet aeration nozzles are not installed horizontally as with traditional systems, but at a downward angle of 15 to 30 degrees, depending on the shape of the basin. In most applications, this system will offer superior performance compared to horizontal systems, which are installed 60 cm deeper in the basin.

Jet aeration benefits

- Low installation cost
- Low energy cost
- High oxygen transfer efficiency
- Longterm, stable efficiency
- Superior mixing, without additional mixers and without oxygen supply (anoxic periods)
- No aerosols
- No cooling of the medium to be aerated
- Frost insensitive
- Superior process performance
- Little susceptible to foam formation
- Almost completely maintenance free and corrosion resistant materials used in the aeration tank (glass fiber reinforced polyester/stainless steel)
- No moving parts in the aeration tanks
- Extremely suitable for use in deep aeration tanks
- Insensitive to clogging
- Average life time cycle of more than 20 years !

Expertise

Throughout the years Task has been able to build up a wide expertise regarding jet aeration in industrial projects.

Some recent projects in water treatment

Jet aeration systems have been successfully integrated in the wastewater treatment plants of several waste collectors and processors (Shanks, Recyc-Oil, Sodecom, Vanheede Environment, Vanheede Biomass Solutions) and in the food industry (Lutosa).