# Jet Aeration Systems

Surface aeration pattern in both process and clean water conditions.

# $K_La$ Systems

Since 2001 $K_La$ Systems has supplied innovative jet aeration and jet mixing systems for industry, water utilities and municipalities around the world. Our industrial customers include food processing, pulp/paper, chemical, pharmaceutical, textile and landfill treatment operations. $K_La$ Systems has the most experienced team of oxygen transfer professionals in the industry and over the past 30 years we have successfully completed more than 1,300 jet aeration/mixing projects in 32 different countries. Our mission is the continual development of our products by embracing modern treatment technologies, improving manufacturing efficiency and reducing our system's carbon footprint.

# Jet Aeration Technology

Jet aerators transfer oxygen by simultaneously introducing large volumes of high kinetic energy liquid and air through a series of jet nozzles. The high velocity liquid exits the inner, primary jet and rapidly mixes with the incoming air in the outer jet. This intense mixing and high degree of turbulence in the gas/liquid cloud travels outward from the jet along the basin floor prior to the vertical rise of the gas bubble column to the liquid surface.

# Applications, Features and Benefits

$K_La$ jet aeration technology is applicable across a wide range of wastewater and biosolids treatment applications including: Air Activated Sludge, SBR, MBR, MBBR, Oxidation Ditch, Aerated Stabilization Basins, Equalization Tanks, Aerobic Digesters and ATAD.

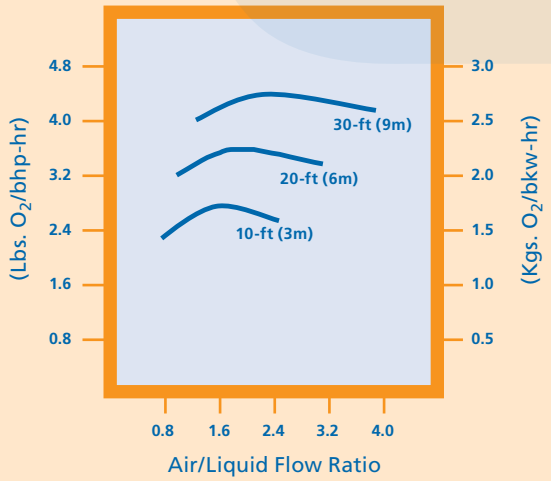
## OXYGEN TRANSFER EFFICIENCY AND ENERGY SAVINGS

In most industrial wastewater and biosolids applications, jet aerators exhibit superior oxygen transfer efficiency compared to other aeration technologies. The hydrodynamic conditions within the jet and fine bubble cloud produce continuous surface renewal at the gas/liquid interface resulting in higher alpha factors. This results in superior process oxygen transfer performance in the presence of surfactants, extracellular enzymes and high MLSS concentrations.

| TYPE OF AERATOR | ALPHA | RELATIVE SOR (%) | RELATIVE POWER (%) |
|---|---|---|---|
| Jet | 0.85 | 100 | 100 |
| Coarse Bubble | 0.70 | 122 | 158 |
| Fine Pore | 0.40 | 212 | 140 |
| Surface | 0.80 | 106 | 144 |

The high alpha factor and clean water oxygen transfer performance of jet aeration technology results in the most energy efficient design for industrial and biosolids applications.

### STANDARD AERATION EFFICIENCY




Large scale SBR jet aeration system for pulp and paper mill with a total oxygen transfer capacity of 320,000 lbs/day.

## LONG TERM, RELIABLE OPERATION

Recent studies by WERF show that fine pore diffusers have reduced oxygen transfer performance and increased pressure requirements over time and the biggest drop off is in the first 24 months of operation. It is not uncommon for these types of aeration systems to require frequent cleaning and replacement within the first five years of operation.

Jet aeration systems are known for long term, reliable operation. Jets have much larger openings, are fabricated with superior materials of construction and are available with an air lift type back flush system that allows for clearing clogged jets without entering the basin. There are many jet aeration systems that were installed over 20 years ago that are still delivering the excellent results they were achieving the first day of operation.

## PROCESS FLEXIBILITY

Jet aerators are easily configured into any basin geometry including circular, rectangular, looped reactors and sloped wall basins. Jet aerators are ideally suited for deep tank processes. The jet oxidation ditch is an example of technology innovation where the combination of a deeper basin design, bottom to top mixing and conservation of momentum combine to make a very efficient treatment process. In this and other applications the independent control of oxygen transfer and mixing is a valuable feature for both process control and energy savings.

JET MANIFOLD AERATOR

RADIAL JET AERATOR

ELEVATED JET MANIFOLD AERATOR

## SUPERIOR MIXING

The powerful horizontal thrust from the jets allows for complete basin mixing without the need for a full floor coverage design. This makes a jet system much less labor intensive to install. In most Activated Sludge processes the jets can still maintain MLSS in suspension without any air input which is why the technology is an excellent choice for de-nitrification processes.

## REDUCED AEROSOLS AND OFF-GAS

Like all submerged aeration devices the jet aerator does not produce the problematic aerosols associated with surface aerators. Due to the high process oxygen transfer performance unique to jet aerators, they require up to 50% less air input than other diffuser systems. This feature results in significantly less off-gas to be handled providing savings on gas collection and treatment costs.

## $K_La$ JET AERATION TECHNOLOGY

$K_La$ jet aerators consist of two general configurations of jet nozzles mounted on specific distribution systems and are supplied as pre-fabricated, monolithic units. Manifold type jet aerators locate the jets on either one or both sides of a liquid distribution manifold.

Radial jet aerators distribute jets uniformly around the circumference of a central, pressurized chamber. Radial aerators are ideal for circular tank applications.

The aerator configuration, number of jet nozzles and nozzle spacing is designed to efficiently, and cost effectively, maximize oxygen transfer and mixing. Effective spacing of the jet nozzles and aeration headers ensures uniform oxygen transfer throughout the basin as well as optimizing the overall mixing process.

In deeper basins the jet nozzles are often elevated and canted downward, which on large scale systems can offer considerable energy savings due to the reduction in blower pressure.

The jet aerators are constructed of fiberglass reinforced plastic (FRP). FRP is economical, durable, lightweight, highly corrosion resistant, and easily assembled in the field. Our FRP materials and fabrications meet all the latest ANSI and ASTM standards. Our standard structural support systems are fabricated from various grades of 300 series stainless steel.


## $K_La$ JET AERATION SYSTEM

A typical $K_La$ jet aeration system consists of the jet aerators, in-basin piping system, back-flush system, liquid recirculation pumps and air blowers. The pumps supplied are either end suction centrifugal, submersible or self-priming. Low pressure air is delivered by positive displacement blowers, low or high pressure screw compressors, multi-stage centrifugal blowers, high speed centrifugal blowers or turbo blowers. Other available jet system components include the out-of-basin air and liquid piping system, which includes 300 series stainless steel pipe, isolation valves, expansion bellow, supports and pressure gauges.

## $K_La$ ENGINEERING

$K_La$ Systems' extensive application, project and field engineering experience professionally guides our customers from the initial inquiry to system start-up.

## $K_La$ PRODUCTION

With both U.S. and overseas production capabilities, $K_La$ Systems can efficiently deliver our jet aeration systems worldwide.

MBBR AERATION SYSTEM

SLOT INJECTOR AERATION SYSTEM

# The $K_La$ Difference

## $K_La$ RESEARCH & PRODUCT DEVELOPMENT

$K_La$ Systems takes great pride in our commitment to research and product development. For over 10 years, our engineering team has carried out process, materials and manufacturing research that has resulted in significant developments in our application technology and systems design. It has led to the introduction of an advanced jet aerator, development of a highly chemical and abrasion resistant PVDF jet nozzle, a polypropylene jet nozzle, and new jet aeration system designs for specific customers' proprietary requirements.

Our process research includes hydraulic testing, clean water shop testing, testing the effects of antifoamer and other chemicals on oxygen transfer, vacuum testing, CFD modeling, and mixing studies.

## PRODUCT DEVELOPMENT: THE FUTURE

In the fall of 2004 $K_La$ Systems, Inc. proudly introduced the **KSI** ($K_La$ Slot Injector) aeration system. We spent two years conducting performance verification and product development. Since 2006 we have successfully applied this unique, innovative, high efficiency jet aerator in over 50 large scale aeration projects.


**FOR MORE INFORMATION ABOUT**
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