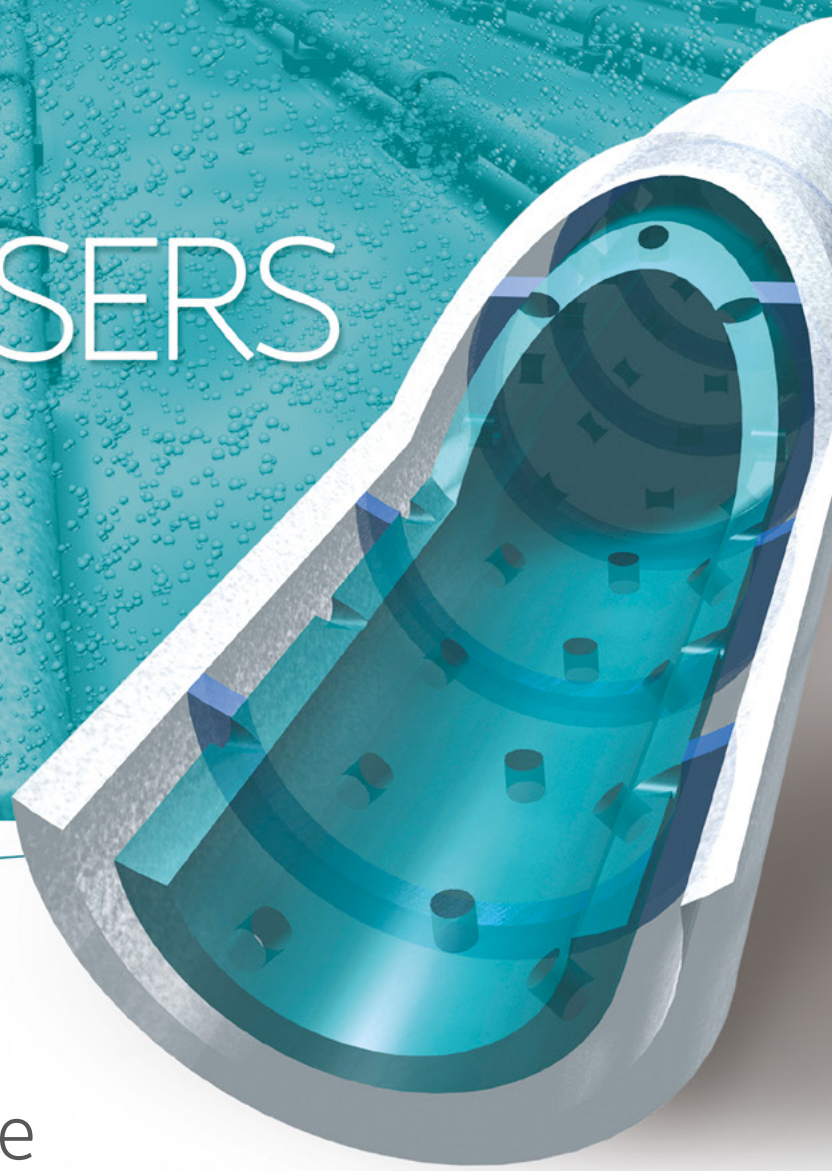
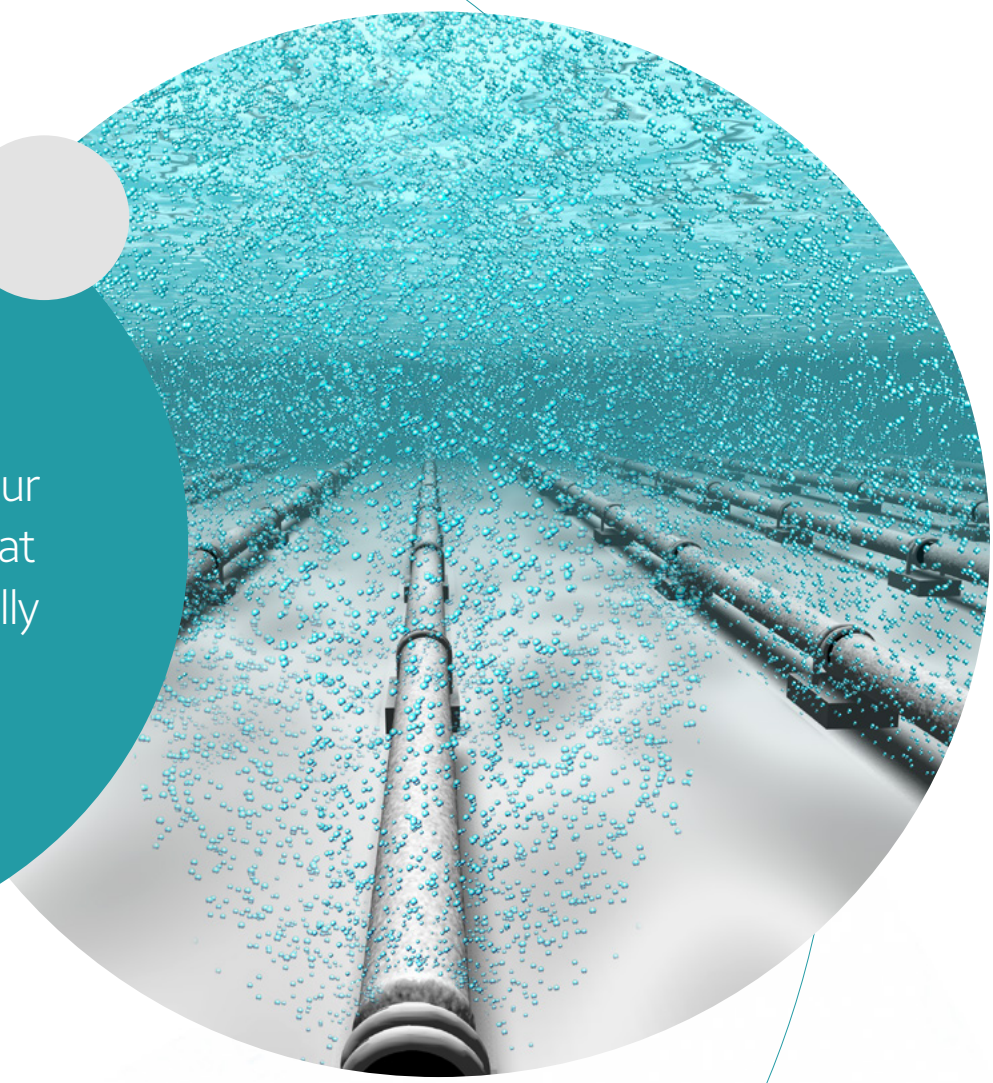
ESMIL EQUIPMENT

TUBE AIR DIFFUSERS



HIGH EFFICIENCY
without maintenance

ESMIL provides up to a 6 year warranty for the air diffusers although our experience indicates that they operate successfully after the expiration of the warranty period.

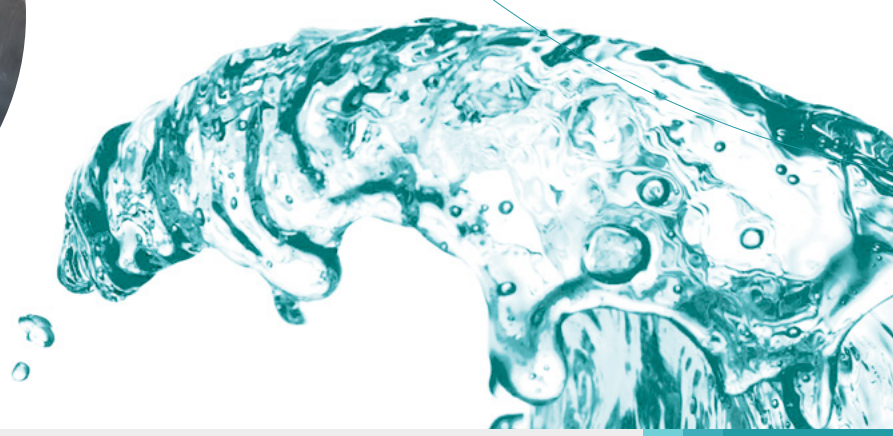


The total air flow rate fed to all ESMIL Air Diffusers in operation exceeds 8 800 000 cfm.

AERATION SYSTEMS on the basis of Tube Diffusers

ESMIL Tube Air Diffusers were developed for application in municipal and industrial wastewater treatment plants.

Their primary use is for supplying the required levels of oxygen to wastewater in the aeration tank while providing efficient mixing.



Advantages of ESMIL Tube Air Diffusers

- **Do not require cleaning and washing.** The external polyethylene layer with "fibro-porous" construction provides for tough, reliable operation of the aeration system without the need for routine cleaning and washing.

- **Effective mass transfer and sludge mixing.** The bubbles which the ESMIL Air Duffusers produce have a diameter of only 0.08-0.12 in which is ideal for oxygen transfer and mixing.

- Due to the internal perforated pipe and "fibro-porous" design of the outer tube, the ESMIL Air Diffusers provide **uniform air distribution over the entire area of the aeration tank.**

- **Additional resistance to water hammers, pressure drops and other mechanical impacts** is provided due to the special design of the ESMIL Air Diffuser.

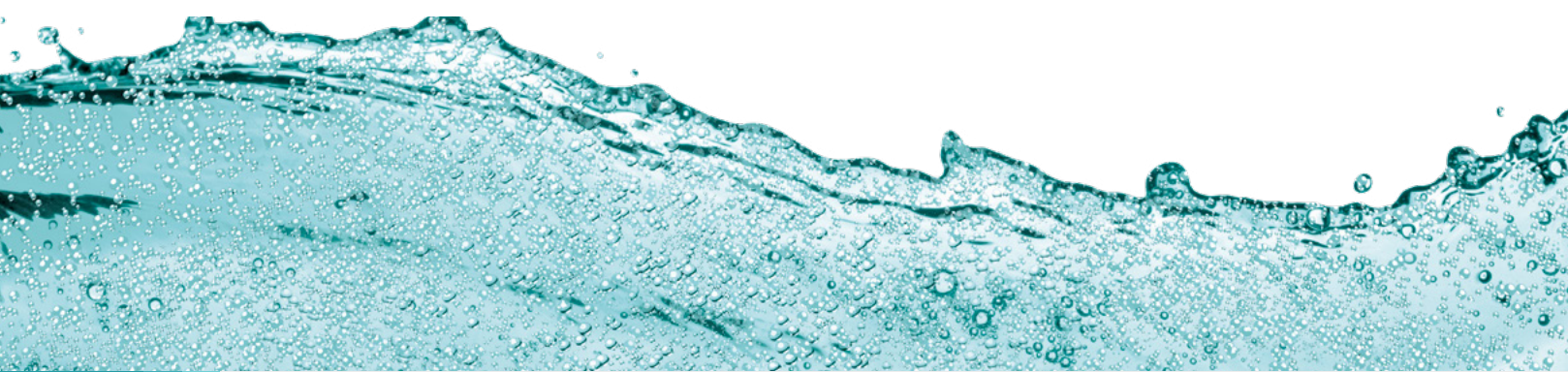
- **ESMIL aeration system is easy to assemble.** Elements of the system are quickly assembled by threaded joints. Duffusers are fastened to the tank bottom in lengths up to 6’ 6”.

- The rate of air flow supplied to our ESMIL Tube Air Duffusers is 2-2.5 times higher than to conventional membrane diffusers. **This provides for lower investment and capital costs on projects.**

- **Reduced operating costs** due to low pressure loss.

- Due to the use of the thermoplastic materials in their design, ESMIL Air Diffusers are **resistant to a wide range of challenging environmental and temperature conditions.**

- ESMIL Air Diffusers provide **consistent, reliable and stable performance during their long service life.**



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Design of ESMIL Tube Air Diffusers

The ESMIL Tube Air Diffuser is made up of two pipes inserted one into another with an air gap running between them.

The outer pipe is porous in construction and is made from low-density polyethylene (LDPE). This pipe is called a fibro-porous disperser. During its manufacturing, a pneumatic extrusion process is utilized, when aerodynamically formed fibers from melted polyethylene are applied on a form-maker forming a pipe.

The inner pipe is made from PVC and is perforated.

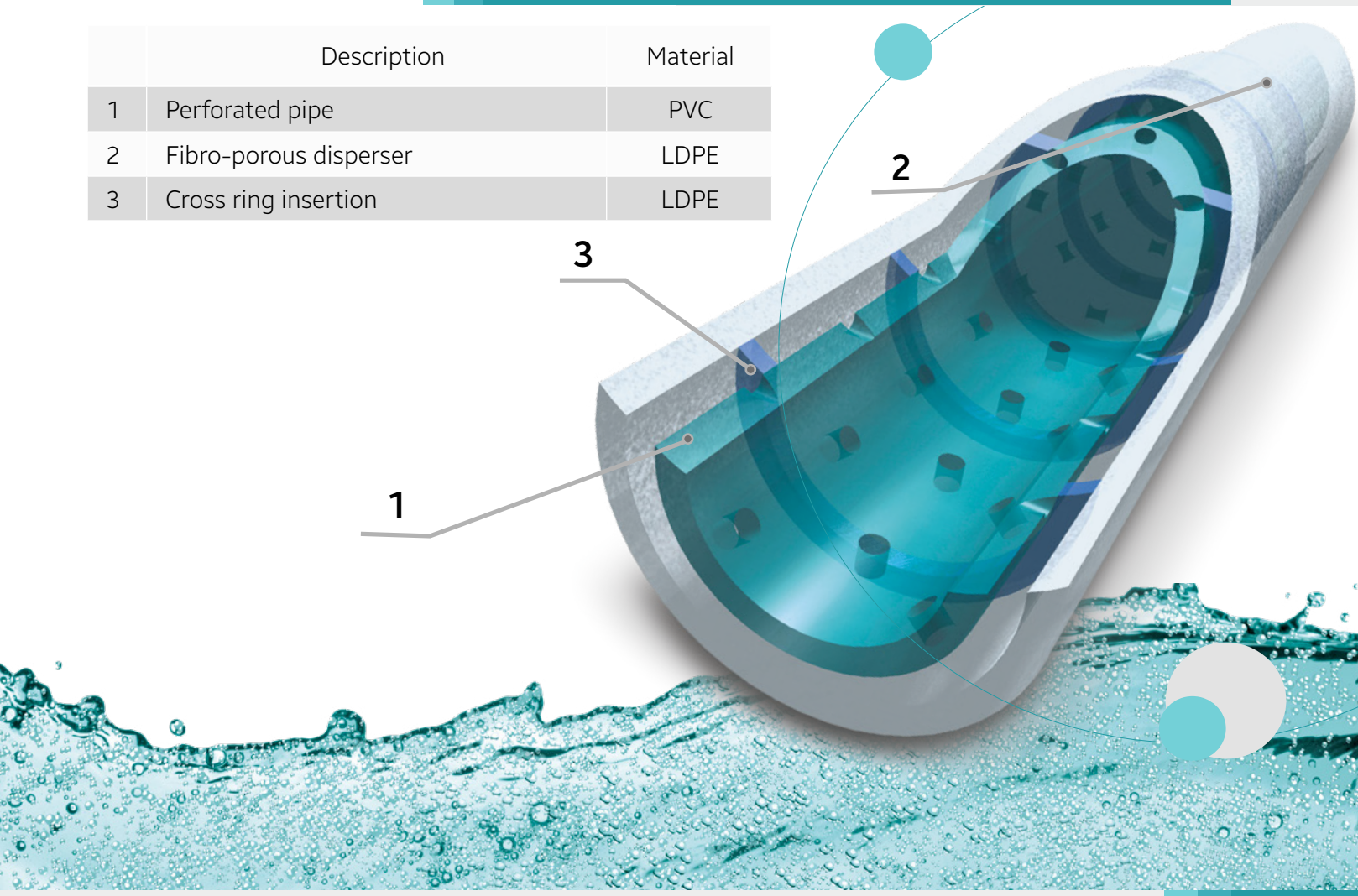
The gap between two pipes is supported by cross ring insertions.

The supply air enters the gap between the inner and outer pipes through the numerous hole openings in the inner supply pipe. The air is then dispersed into the aerated liquid through the «fibro-porous» construction of the outer pipe forming numerous and consistent bubbles.

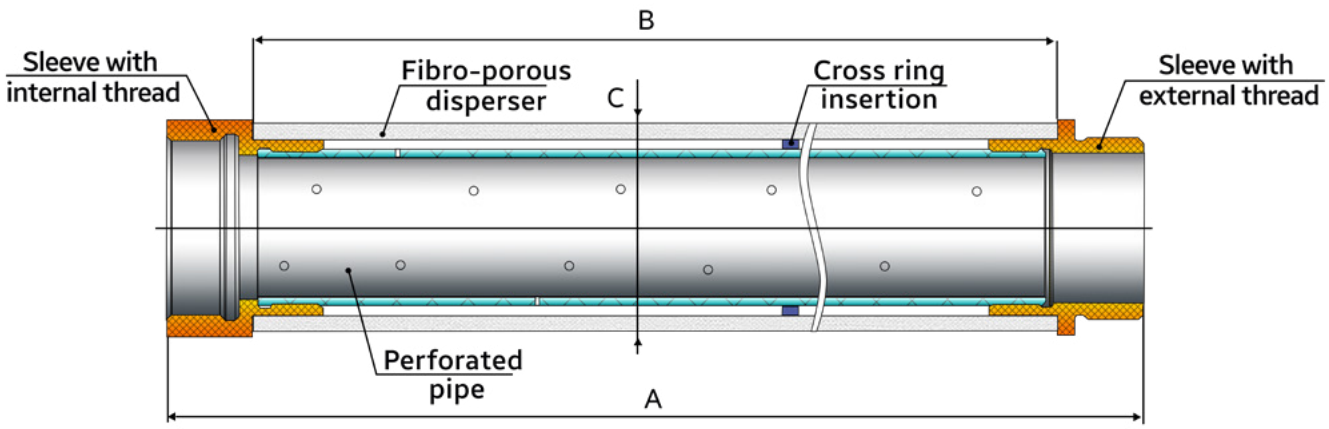
Forcing the air into the inner pipe and uniformly out through the «fibro-porous» outer pipe provides a consistently uniform air distribution in the liquid you want aerated. This enables us to achieve a superior aeration efficiency with minimal energy cost.

COMPONENTS AND MATERIALS

	Description	Material
1	Perforated pipe	PVC
2	Fibro-porous disperser	LDPE
3	Cross ring insertion	LDPE



Dimensions



Type	Total length (A), in	Disperser length (B), in	External diameter (C), in	Disperser wall thickness, in	Total weight, lbs
APKV-1	40.2	37.0	4.72	0.39	8.8
APKV-2	79.7	76.6	4.72	0.39	17.6

ESMIL Tube Air Diffusers allow the significant reduction of energy consumption at wastewater treatment plants.

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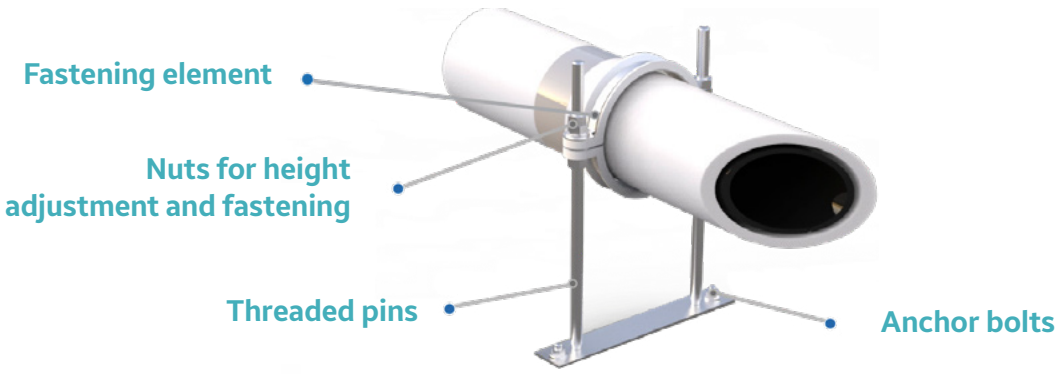
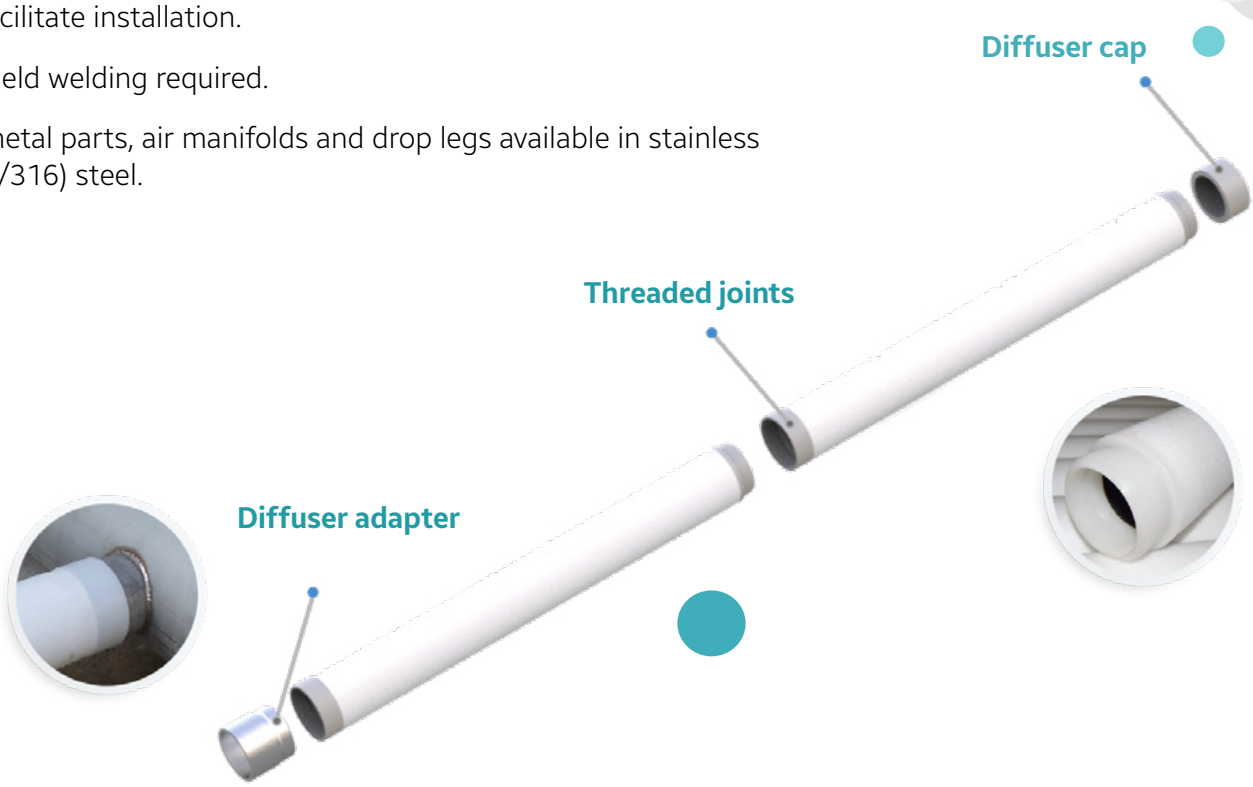
Installation

Threaded diffuser support features height adjustment to ensure accurate branch levelling.



Installation of the ESMIL aeration system

- Threaded diffuser joints feature simple installation in branches up to 130 ft lengthand result in fewer air manifolds.
- Air manifolds are delivered with factory-welded diffuser adapters to facilitate installation.
- No field welding required.
- All metal parts, air manifolds and drop legs available in stainless (304/316) steel.

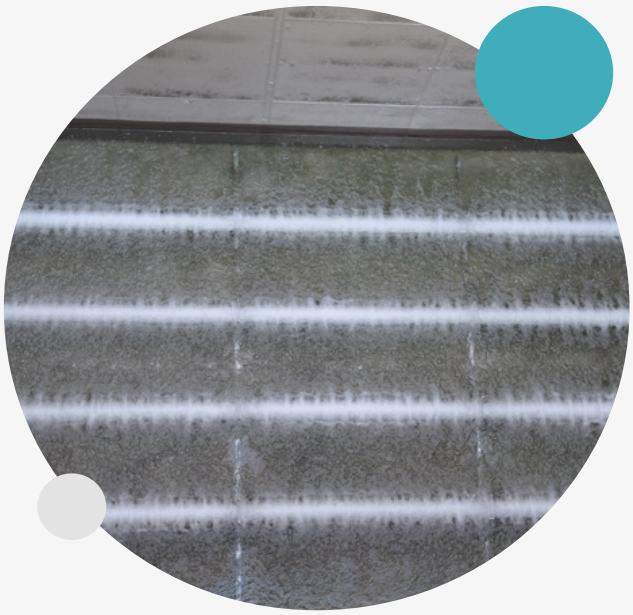


Clean Water tests results

In August, 2018, ESMIL group completed clean water oxygen transfer tests of APKV tube diffusers in accordance with ASCE/EWRI Standard 2-06 'Measurement of Oxygen Transfer in Clean Water'.

The tests were performed by ASESORÍA TÉCNICA Y CONTROL in a 300 ft^2 35.500 gal shop-scale test tank located in Terrassa, Barcelona, Spain and built solely for clean water oxygen transfer applications. Diffuser density, diffuser submergence (14.8 ft to diffuser top surface) and air flows applied during the tests were representative of typical design and real life application. Data obtained during the tests was corrected to a reference TDS concentration of 1.000 ppm in accordance with Commentary B of ASCE/EWRI standard.

In addition to clean water oxygen transfer tests, pressure losses of APKV diffusers were also measured.



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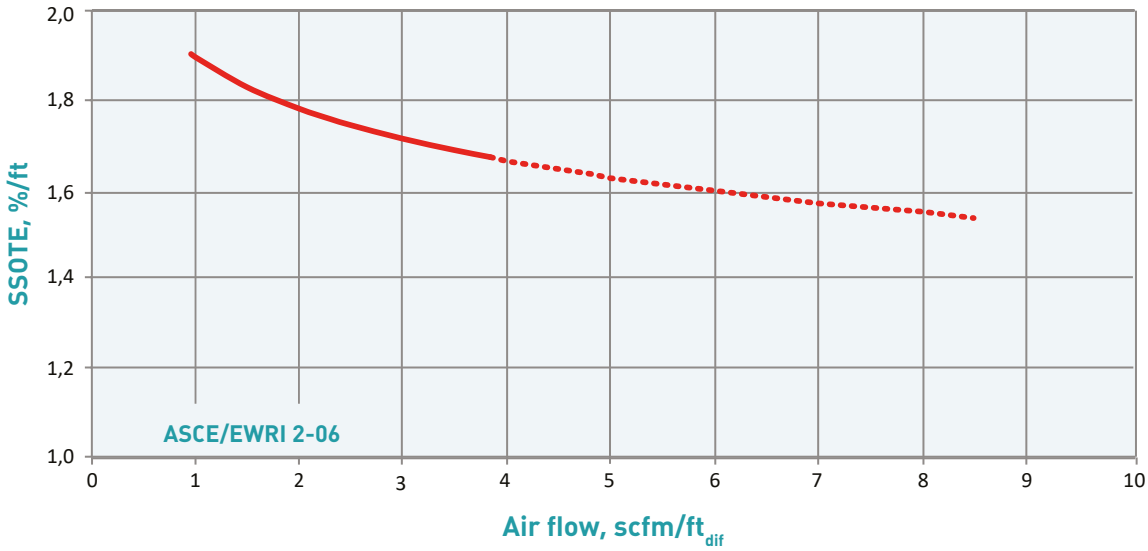
Performance characteristics of APKV diffusers

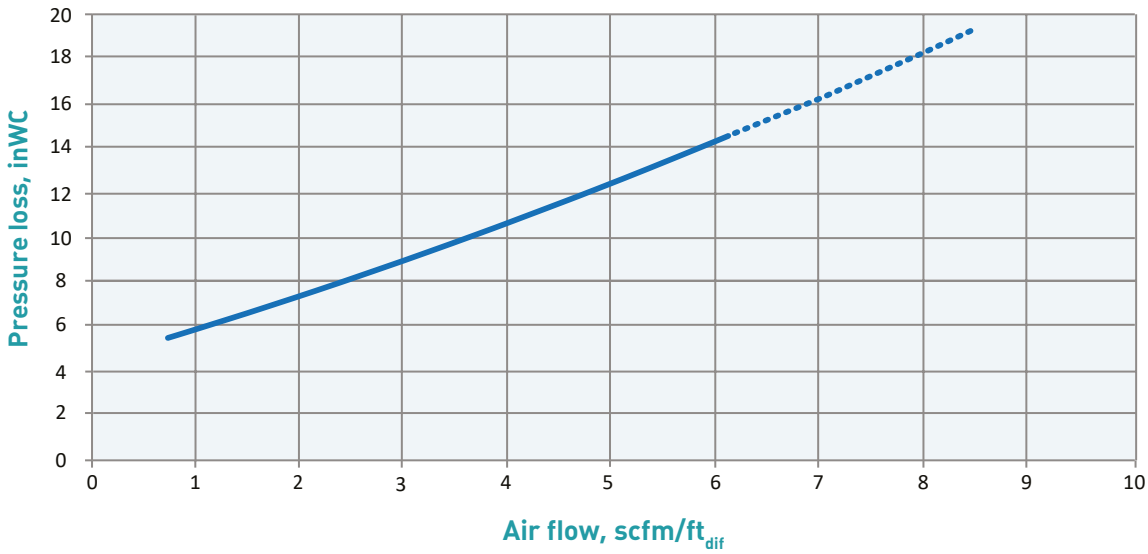
1) 68 °F, 14.7 psi.
2) At design air flow.

Air flow range	1.0–8.5 scfm/ft_{dif} [1]
Design air flow	1.5–4.8 scfm/ft_{dif} [1]
Air diffuser diameter	4.72 in
Air diffuser length	40.2 or 79.7 in
Bubble diameter	0.08–0.12 in
SSOTE[2]	1.64–1.83 %/ft
Pressure loss[2]	6.6–12.0 inWC

Oxygen transfer efficiency



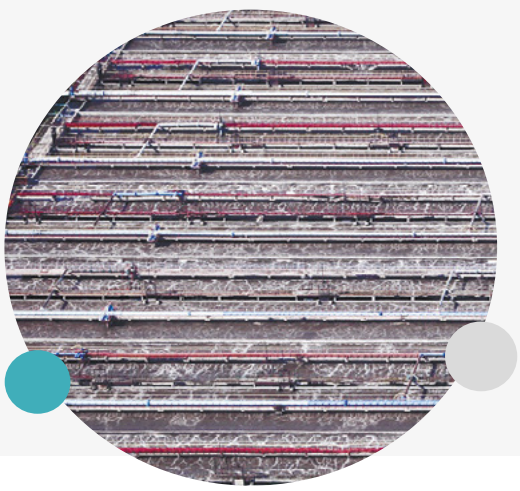
Pressure loss characteristics



More than 400 water and sewage companies in 12 countries have chosen ESMIL Tube Air Diffusers.

We offer our clients:

- Inspection of wastewater treatment facilities prior to their reconstruction (analysis of qualitative and quantitative composition of wastewater for the selection of the optimal treatment method);
- Individual approach to each facility. The application of nonstandard solutions and various methods of installation;
- Selection of air diffusers based on calculated, experimental and laboratory data;
- 6 year warranty period with the actual service life of 12 years;
- Installation and comissioning of our equipment.



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For more than 25 years ESMIL Group has delivered more than 400 miles of air diffusers and continues to increase this output.

For more than 25 years of work we have gained the unique experience that allows us to offer customers only the most effective solutions.

Reference of the Chief of wastewater treatment facilities and pump stations in Herzliya city (Israel):

"... In November 2013 we launched the first section of the reactor with ESMIL tube air diffusers.

The results exceeded all of our most optimistic expectations. The quantity of consumed air as well as the energy was significantly reduced.

Liquid saturation with oxygen was stable and uniform throughout the whole basin. After 2 months, without waiting for the end of the 6-month trial operation period initially agreed to, it was decided to replace the existing diffusers in the two other sections with ESMIL Air Diffusers.

Today the entire reactor (3 sections) is equipped with ESMIL Air Diffusers and we are very pleased with the results obtained. The desired concentration of oxygen (approx. 2 mg/l) is maintained in all sections with much lower energy consumption.

Most of the day (14-16 hours) we use one air blower (160 000 ft^3) and during peak hours (8-10 hours) we use two blowers, whereas before the replacement of the aerators we had to use 2-3 air blowers".

ESMIL
EQUIPMENT

ESMIL GROUP

ESMIL Group is a leading manufacturer of equipment for wastewater treatment.

ESMIL Group focuses in the development, production and implementation of modern high quality technological equipment dedicated to municipal wastewater treatment as well as industrial applications in food process, cement, chemicals, coal and metal process enterprises.

Our company produces **more than 35 different types of equipment** for mechanical treatment, biological treatment and sludge dewatering. A wide range of ESMIL brand products allows us to offer our customers complex solutions using equipment we produce.

Our company's production plant is located in Akron, OH. Company headquarter is in Poland. **More than 300 highly qualified specialists** of ESMIL Group work to provide high quality services and equipment.

ESMIL equipment is successfully **operated in more than 33 countries** of the world.

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