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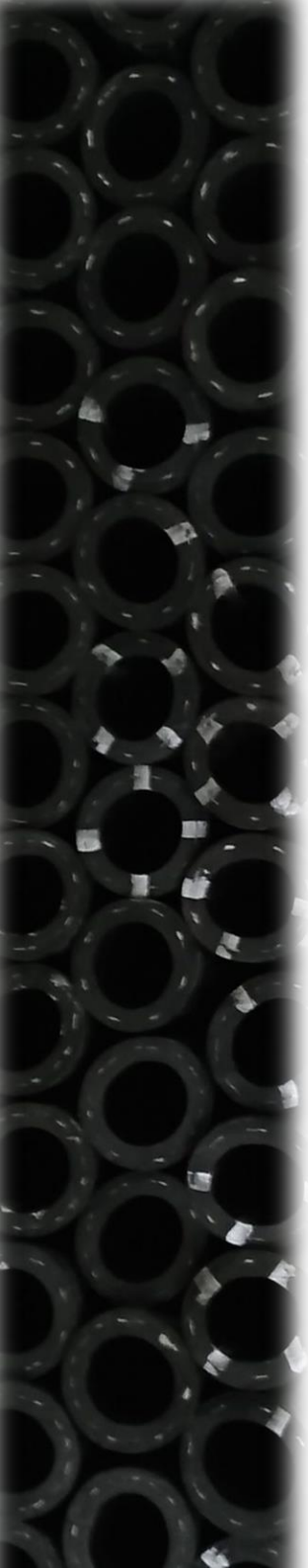
Modern microbubble solutions

Low pressure micro bubble diffuser AIRPRAX



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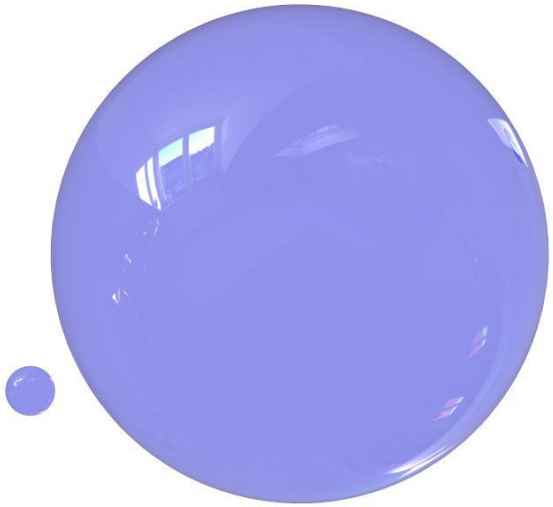
Why micro bubbles have bigger oxygen transfer than fine bubbles?



Micro bubbles have bigger surface area obtained from the same amount of air than in case of fine bubbles.

That surface between air and water is a place where oxygen penetrate to water. So the bigger contact surface is the faster oxygen dissolved in water. Diameters of microbubbles produced by our diffusers is about 50…500 µm, when average fine bubble diameter is 5000 µm. It is easy to calculate that the same quantity of air in microbubbles has 10 times bigger surface area than in fine bubbles.

E.g. One liter of air change to 5mm bubbles. Using the formula for the volume of the ball, we can calculate the volume of one bubble:

$$V = \frac{4}{3}\pi r^3$$

$$r_1 = \frac{d}{2} = 2{,}5\ mm$$

$$V_1 \approx 65{,}5\ mm^3$$

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Divide 1 000 000 mm^3 (1l) per 65,5 mm^3 get 15267 bubbles. Using the formula for the surface area of the ball, we can calculate area of one bubble:

$$P = 4\pi r^2$$

$$P_1 \approx 78{,}5\ mm^2$$

So, 15277 bubbles surface multipled by 78,5 mm^2 gives us about **1,2 m^2 exchange area**.

Repeat calculations for 0,5mm bubble diameter:

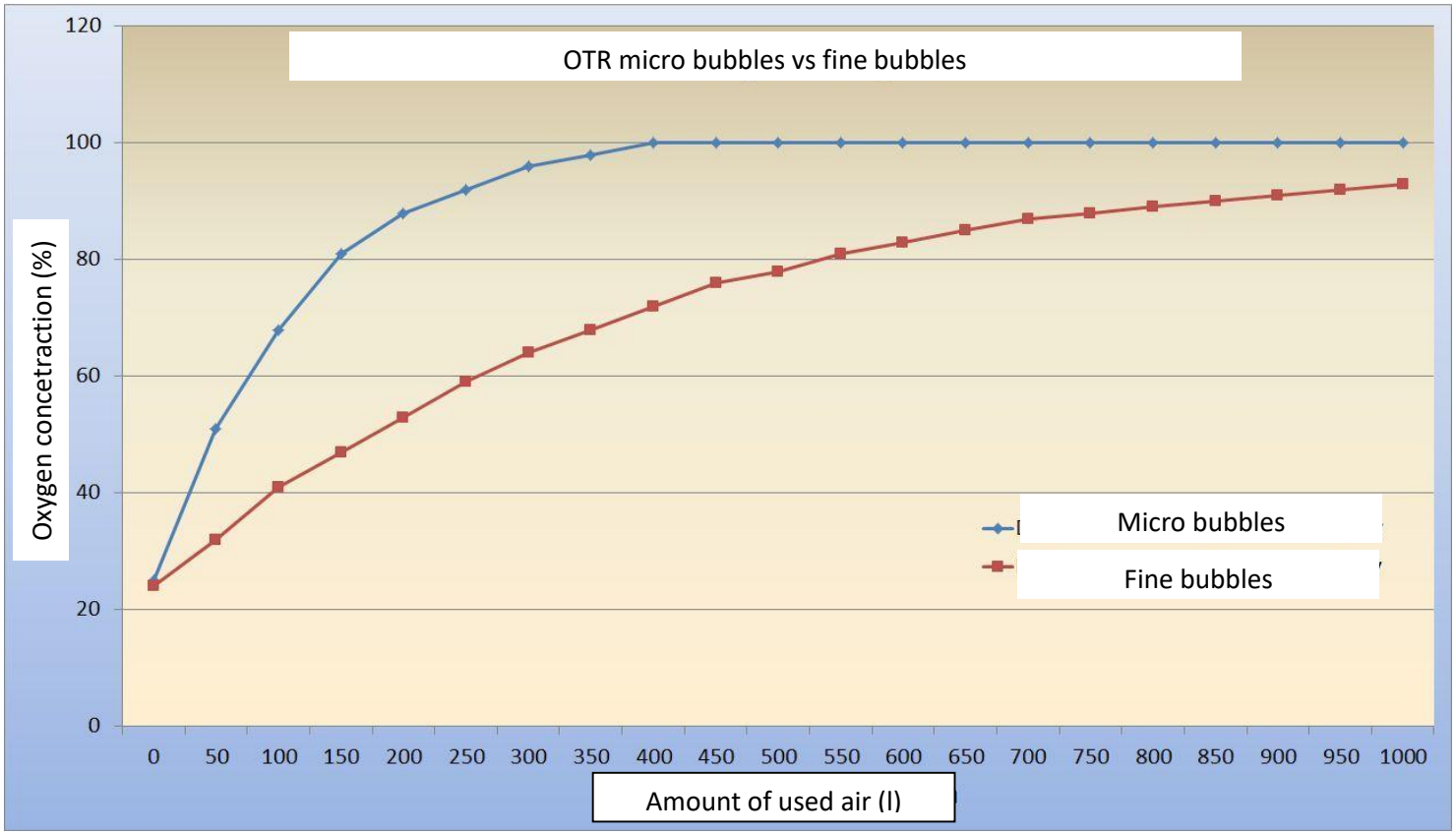
$$r_2 = \frac{d}{2} = 0{,}25\ mm$$

$$V_2 \approx 0{,}0655\ mm^3$$

$$P_2 \approx 0{,}785\ mm^2$$

Receive 15 290 520 bubbles which **exchange area is about 12 m^2**. It is 10 times bigger area obtained from one liter of the gas than in case of fine bubbles. It is worth pointing out that in this calculation we use quite big microbubbles (500 µm). For instance in case of 100 µm bubbles, surface area of all bubbles obtained from 1 liter of gas is 60 m^2.

What is worth mentioning is small ascent speed of microbubbles. Fine bubbles moving to the surface with speed of 30 cm/s, in microbubble case it is 5 cm/s. So time of dissolving bubbles in water is about six times longer witch microbubble use.



Graph with experience results of comparation fine and micro bubbles aeration method**.** Water temperature was 24,5°C Fine bubbles diffuser were supplied with 25 l/min speed, micro bubble 10 l/min. As you can see on the graph microbubble diffuser needs only 400 liters of air to obtain 100% of oxygen concetration while fine bubble, despite the use 1000 liters of air, obtains only 92% of oxygen concetraction in water.

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Comparation:
amount of bubbles obtained with the same airflow (2,5 l/min) in micro bubbles (up) and fine bubbles (down)

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What is AIRPRAX ?

AIRPRAX is patented, micro bubble, linear diffuser made of EPDMX rubber hose. Importantly, works with low pressure. Standard inner diameter is 12,5mm, outer 19mm. Every AIRPRAX has about 60.000 laser made, micro perforations per 100 cm lenght. Holes are so small that it is really hard to see them with the naked eye. Hose construction of AIRPRAX let to obtain bigger performance and universality of diffuser. Due to the complicated production process maximum length of one AIRPRAX is 200cm.

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Connectors for AIRPRAX

AIRPRAX is very universal and can be used in many different ways. For standard use, like **long lines, nets or circles** we recommend dedicated plastic connectors. Cannectors diameters are carfully selected and don't need clamping bands to ensure tight and stable connection. AIRPRAX can work in long line up to 10 meters.

Balasting

For standard use, like long lines, nets or circles AIRPRAX requires ballast to lie on the bottom of the tank. We recommend to use inner balasting in the form of metal line or rods. For use with air good enough is galvanized stell. For oxygen it is better to use stainless steel. This kind of ballast has no sharp edges outside, it is completly save and elegant. Recomended diameter of steel line is 5mm, rods 4mm.

Gas suplly

Pressure drop on AIRPRAX with airflow 2,5 l/min (100 cm lenght) is up to 350 mbar. For optimal work diffuser should be supplied with low pressure gas. In aeration, it is recommended to use low pressure, oil free piston or vane pumps. Compressor should provide cleaning pressure (about 1000 mbar). No additional filtration or dehydration is required. E.g. Cheap pump with power consumption 120W is able to supply 30 meters of AIRPRAX in 1 meter depth.

Available variants

AIRPRAX membane – Just AIRPRAX hose without any addings. The most popular and universal product.

-Available Sizes: 50, 100, 150, 200 cm.
-With bigger amounts it is possible to produce other lenghts (up to 200cm).
-For distributors we offer printing their own text on hoses.

AIRPRAX diffuser – Ready diffuser made of AIRPRAX, reduction connector, ballast and stopper.

-Reduction connector to hose 10mm or 6,3mm.
-Stainless steel pipe or line for ballast.
-Available Sizes: 50, 100, 150, 200 cm.
-With bigger amounts it is possible to produce other lenghts (up to 200cm).
-For distributors we offer printing their own text on hoses.

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AIRPRAX long lines – group of diffusers connected with plastic connectors to make line.

-Reduction connector to hose 10mm or 6,3mm.
-Stainless steel pipe or line for ballast.
-Available Sizes: 50, 100, 150, 200 cm which can be connected to line up to 10 meters long
-With bigger amounts it is possible to produce other lenghts (up to 200cm).

AIRPRAX in frames – Stainless steel frames with AIRPRAX inside. Available in different sizes. Produced on individual order.

-Every amount of hoses.
-Stainless steel 304.
-Available Sizes: from 40x40cm to 200x200cm.
-Option DUO, with hoses to air and oxygen.

Technical data

Outer diameter	19 mm
Inner diameter	12,5 mm
Sizes	50, 100,150,200 cm
Margins lenght	Each 30 mm
Perforation per 100cm	60 000 points
Open pressure	250 mbar
Normal operation pressure	350 mbar
Maximal operation pressure	500 mbar
Cleaning pressure	1000 mbar
Maximal cleaning pressure	3000 mbar
Airflow per 100cm	2,5 l/min
Weight 100cm	300 g
Material	EPDMX +textil
Operating temperature	-30…+130 °C
Operating gas	Air, Oxygen, Ozone

Links

> AIRPRAX and micro bubbles <

> AIRPRAX in aquarium 2 <

> Line AIRPRAX in pond <

> Comparation of fine and micro bubbles in aquarium <

> Comparation of fine and micro bubbles in pond <

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