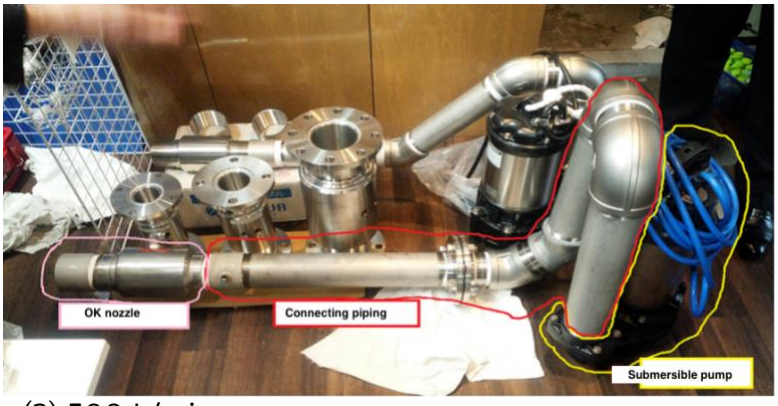
How to connect the large OK Nozzle (100 L/min and above) to a submersible pump

Takeshi Matsunaga
OK Engineering. co., Ltd.

For many purposes, such as river/pond purification, sewage treatment, plant cultivation, aquaculture, and so forth, OK Nozzles are connected to submersible pumps such as in the example photos below. The configuration can vary depending on the site, but in every case loss of pressure due to turbulence in the pump must be prevented. The key is to configure the piping in a way that most ensures the water entering the nozzle is as laminar as possible.

A. Horizontal Installations (below 4m depth)
If the water depth is within 4m, we recommend installing the OK Nozzle horizontally near the bottom, as in the photos below, so that the bubbles are ejected and spread horizontally at maximum depth. The photo (4) example is a 500 L/min OK Nozzle with 1500mm or more of straight piping between the nozzle and the pump to maximize laminar flow.


(1) 400 L/min



(2) 500 L/min


(3) 1,200 L/min


(4) 500 L/min

B. Vertical Installation (above 4m depth)
If the water depth is 4m or more, we recommend submerging the OK Nozzle several meters below the surface and ejecting the bubbles vertically downward. In the photos below, a 45-degree socket is attached to the nozzle injection port to eject the bubbles clear of the submersible pump and prevent it from inhaling the bubbles. Alternatives to the angled socket, such as a barrier or covering, may also be employed to prevent pump inhalation of the bubbles.


(5) 100 L/min


(6) 200 L/min

2. Outdoor Filter Requirements (SUS wire netting)

When operating outdoors, in rivers, etc., surround the pump with SUS steel perforated metal so that debris is not sucked into the pump. You can wrap the FB generator loosely with SUS wire mesh, too. The bottom plate does not have to be perforated.
As shown in photo (8), the OK Nozzle can protrude out of the perforated metal.


(7)


(8)

3. Sludge Prevention

Assuming a firm base, set up supporting legs as shown in photo (9) to prevent environmental sludge, etc. from being sucked into the pump. Decide the height of the legs in accordance with the expected level of sludge so that your apparatus is sufficiently above it.

(9)

4. Pump Selection Criteria

Within the context of the pump performance curve, important factors for pump selection includeshould be determined by:
1) the use and purpose of the fine bubbles, and the required bubble discharge volume.
2) the water pressure applied to the nozzle. This factor varies depending on the condition of the water, whether it is freshwater or seawater, and the expected nature of environmental debris and pollutants.
3) the effect of nozzle positioning on water pressure. If the nozzle is installed between piping and there is a sufficiently long pipe on the nozzle discharge side, the water pressure may be increased. If the nozzle is installed to the pipe end face, the water pressure is determined more by conditions 1) & 2).

5. Regarding sewage and wastewater purification treatment

A. Water Pressure
Depending on the degree of contamination, select a pump that applies water pressure of 0.15 to 0.25 MPa to the OK Nozzle. The higher the concentration of particulate matterharder the dirt, the higher the necessary water pressure.

B. Gas Intake
In the case of sewage and wastewater treatment, a large amount of oxygen is required, and the intake port should be fully open to maximize oxygen flow. If the water is dirty, the coalescence of the bubbles will be hindered, and a large number of fine bubbles will be generated and also the amount of dissolved oxygen will increase.

C. IMPORTANT: must combine with bio-carriers

Microbes are activated by fine bubbles. This mechanism has not been elucidated scientifically, but it is certain that it exerts a great effect. By adding a carrier that serves as a habitat for microorganisms, the processing capacity is further increased.
In the case of water treatment, it is essential to use fine bubbles and carriers in pairs.

Bio-carriers are a well established and essential component of wastewater treatment systems. These host the microbes that accelerate biodegradation. The role of fine bubbles is to maximize oxygen delivery to the biodegradation process. Fine bubble systems should always be used in combination with bio-carriers in wastewater treatment.