

# Predicting the Proportion of Discharged Air from an Aeration Tank

Case Study for TAIKO KIKAI INDUSTRIES CO., LTD.

Evaluating gas-liquid two-phase flows using a dispersed multi-phase flow analysis function

## Analysis Purpose

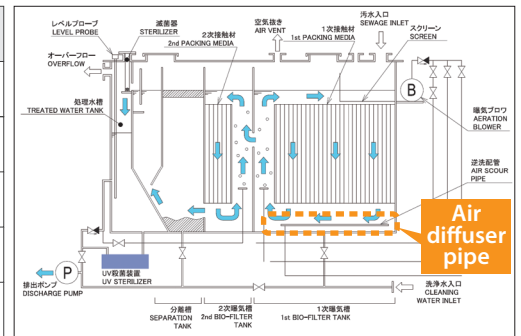


The Taiko Ships Clean "SBH Series"

Seaworthy marine sewage treatment equipment must be compact and highly efficient. Vital for improving the performance of the device is evening out the amount of aeration from the air diffusion pipes as shown in the diagram. In this study, the dispersed multi-phase flow analysis function in SC/Tetra was used to predict the gas-liquid two-phase flows, and to evaluate the distribution and total amount of aeration. These results were used to optimize the shape of the air diffusion pipes.

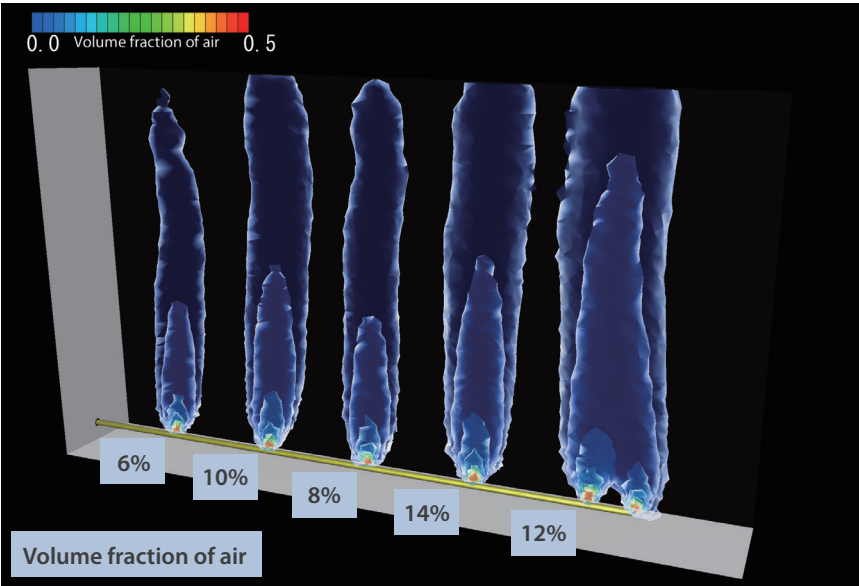
Items	SBH-15	SBH-25	SBH-40	SBH-65
Average of sewage volume (L/day)	900	1500	2400	3900
Peak of sewage volume (L/h x time/day)	94x1	156x1	250x1	406x1
BOD load (g/day)	202.5	337.5	540	877.5
Blower air flow (m <sup>3</sup> /min)	0.1	0.255	0.40	0.59
Discharge pump capacity (m <sup>3</sup> /h)	4 (60Hz)		3 (50Hz)	

Standard specification



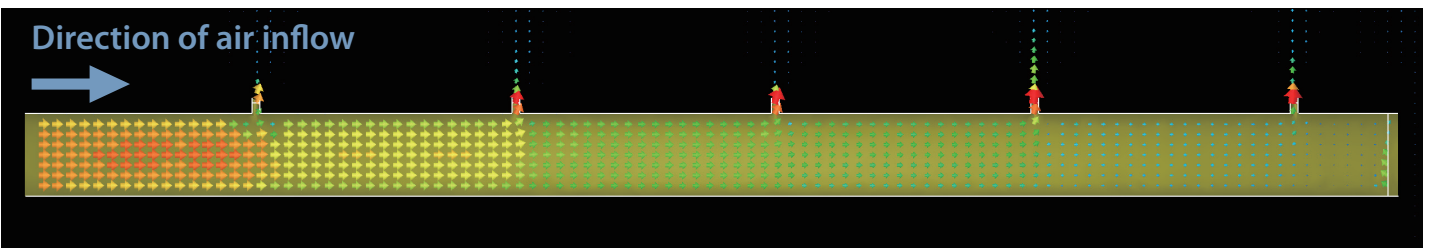
Schematics

## Analysis example



The diagram shows analysis results for the distribution of air released from the air diffusion pipes for a specific inflow condition. Traditional thinking said the amount of released air would be greater near the air supply. But the analysis results contradicted this once the air system was fully filled. This was thought to be due to the diameter and layout of the air ejection holes affecting the velocity distribution within the air diffusion pipes. This, in turn, affected the distribution of the air from the pipes.

The calculation results correlated well with experimental measurements for the validation case. Additional analyses were performed to determine the optimal shape of the air diffusion pipes.



## Customer Comments

Using SC/Tetra enabled us to design the air diffusion pipes for a marine sewage plant without having to perform water tank model tests. Test results for the actual device showed that the air was evenly aerated. This confirmed the value and effectiveness of using SC/Tetra during the design and development phases.