Study (Application to Deep Tank) on Membrane Plate Type Aerator

Whole term	2004.6～2005.3	

(Purpose)

Membrane plate type aerator is a diffuser, featuring high oxygen transfer efficiency and wide air load control range, which enables to reduce the electricity consumption due to reduction of aeration air volume and responds to CO_2 gas exhaust restriction control, thus contributing to prevent global warming. The Institute has conducted "joint study on membrane panel type aerator" for the period from 2004 to 2005, and compiled the technical manual of this technology. Objective of this study was to determine design value of oxygen transfer efficiency for deep tank, verify introduction effect, define design conditions, add application to deep tank to technical manual issued in year 2003, and finally renew the technical manual.

(Study Result)

(1) Design Value of Oxygen Transfer Efficiency (OTE) for Deep Tank Aeration

Design value of OTE for deep tank aeration is determined with an account of OTE values measured in clean water of test tank and OTE values measured in wastewater of actual operation tank. Since OTE value of deep tank varies depending on its tank width, OTE design value is divided into two stages according to tank width. The determined design OTE value is as follows:

Table – 1 Design Value of Oxygen Transfer Efficiency for Deep Tank Aeration Method

Aeration Method	Aeration Depth (m)	Tank Width (m)	
		Less than 8m	8m or more
Aeration Method for Deep Tank	5.0	24%	27%

(2) Introduction Effect (Aeration Method for Deep Tank)

For confirmation of an effect of introduction of membrane plate type aerator for deep tank, model designs are implemented according to the determined OTE design values (see the followings for the results). It is found out that, regardless of new or renewal establishment, power saving for aeration blower is attained about 30% against diffuser plate and about 40% against submerged aerator (including its aerator's power).

＜Model Case＞

① New Establishment (Blower newly selected according to membrane panel aerator)

② Renewal Establishment (Aeration depth determined according to existing aerators operated in rows.)

＜Study Conditions＞

Treatment (Day Max)	27,000m^3/day/basin x 8 basins = 216,000m^3/day (nitrification is taken into account)
Tank Size	W10.0 m × L80.0 m × H10.0 m Tank volume 8000m^3/basin
Comparison	Diffuser plate (OTE 17 %), Submerged aerator (OTE 21%)

Table – 2　Study Result of Model Cases

Item	Unit	Model Case 1			Model Case 2		
		Membrane	Diffuser plate	Sub Aerator	Membrane	Diffuser plate	Sub Aerator
Aeration Depth	m	5.0	5.0	5.0	4.5	5.0	5.0
SOR	kgO_2/d	8,817	8,817	8,817	8,844	8,817	8,817
OTE	%	27	17	21	24	17	21
Required Air Volume	m^3/min	81	129	107	92	129	107
Blower Power※1	kW	114	169	207	120	169	207
Yearly Cost※2※3	—	100	125	145	100	117	143

※1　Power for submerged aerator is sum of blower and agitation.　　(Value calculated　per one basin 27,000m^3/d)

※2　Index in case that membrane panel type aerator is 100.

※3　Yearly　cost　＝Equipment Cost/10 years + Electrical Cost

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Suido Kiko Kaisha, Ltd., Sumitomo Heavy Industries, Ltd., Takuma Co., Ltd.,
Tsukishima Kikai Co., Ltd., NGK Insulators, Ltd.,
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