

3. Biofiltration

(VOCs)

()

- I.
- II. VOCs
- III. Biofilter system
- IV.
- V.
- VI.

I.

50%

(Hanson,

1992).

(Environmental Protection Agency, EPA)

1990

Clean Air Act

Amendment (CAAA)

(Volatile Organic Carbons; VOCs),

189

(EPA, 1990). CAAA

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3. Biofiltration



600

(Miller, 1990).

가

1995

12

1999 1 1

VOCs

VOCs

biofiltration

system

가

II. VOCs

(1)

(Adsorption)

VOCs

가

VOCs 2

(Absorption)

< > 3. Biofiltration

VOCs
가 VOCs 2 가 .

(Condensation)

Saturation phase change VOCs
VOCs가 VOCs
가 가 .

(Incineration)

VOCs
가가 VOCs 2
.

(2) (Biofiltration)

VOCs .
가가 . VOCs
가 (1,000 ppm) VOCs

VOCs

가 VOCs
VOCs 가 .

VOCs 가,
VOCs phase change .

< > 3. Biofiltration

, VOCs , VOCs ,

가가 (Martin et al., 1992; Kosky and Neff, 1988)

, VOCs 가 가

VOCs air stream 가 1,000 ppm , biofiltration

, 가, 가

- 1 - (Purcell, 1986).

, () ()

biofilter 2.5 , 16

(Jaeger and Jager, 1978).

가가 가 가

가 .

biofiltration

99% , , ,

90% .

biofiltration , ,

. 1

biofilter

가

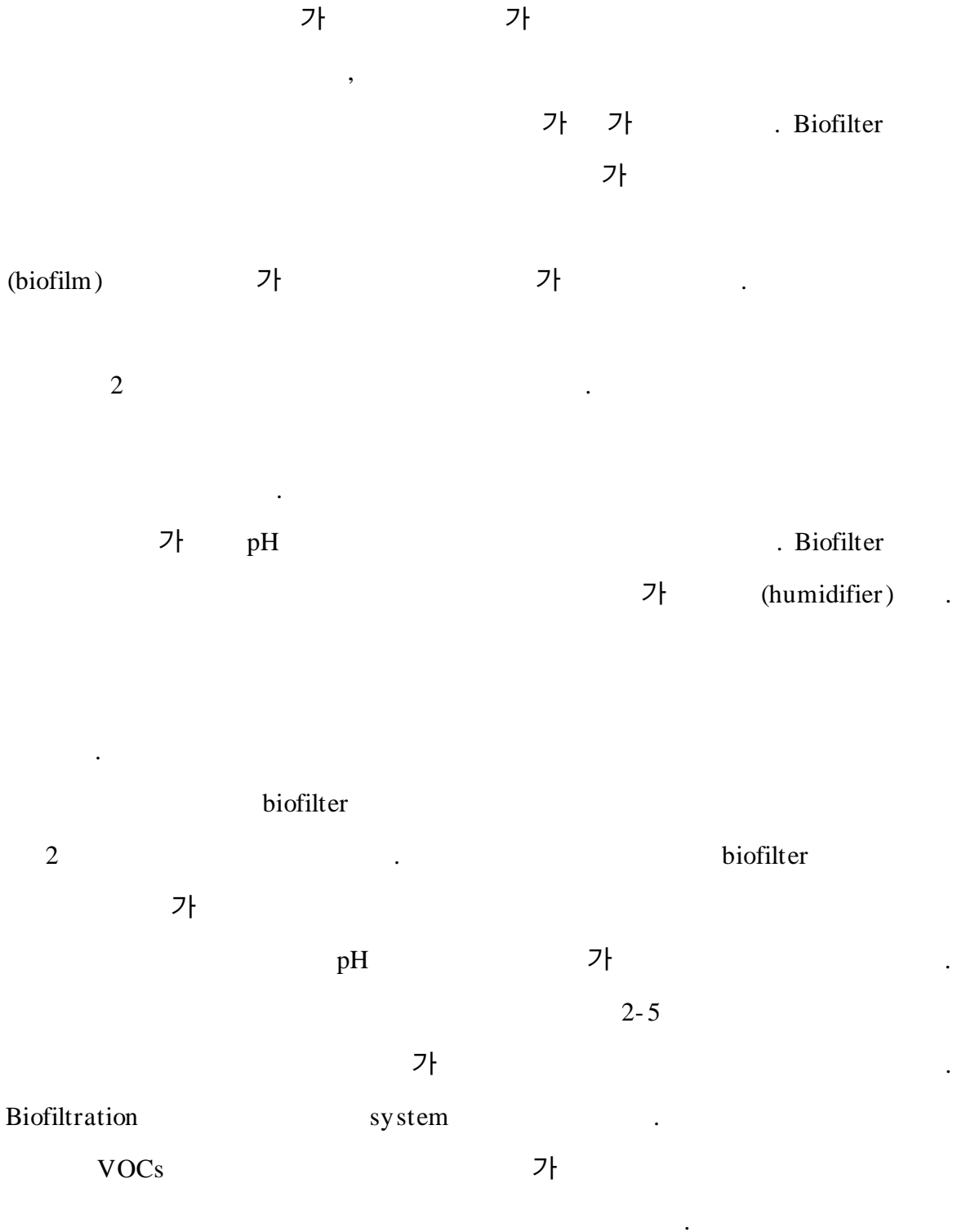
(Leson & Heydari, 1992).

III. Biofilter system

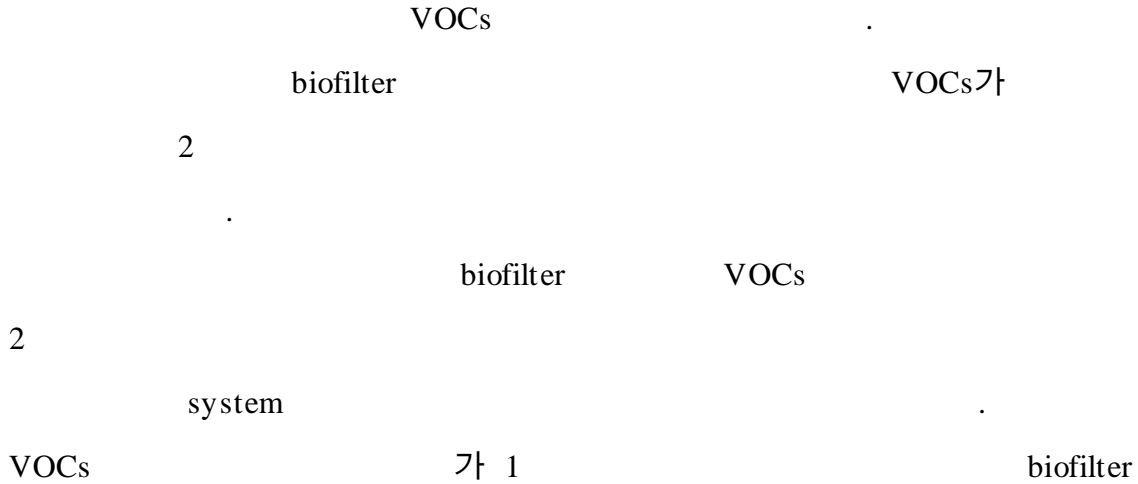
VOCs biofilter system 가

, (filter bed) (2).

< > 3. Biofiltration



< > 3. Biofiltration



IV.

Biofiltration 1923 Bach가
 (Leson and Winer, 1991) 1950

(Pomeroy, 1957; Hartman, 1976). 가

BIOTON BIOBOX biofiltration system
 (Paul and Ross, 1991). 500
 biofilter가 가 (Schirz, 1975), (Gust et al.,
 1979), (Pomeroy, 1982), (Ottengraf, 1986),
 (Bohn, 1992)

가 biofiltration 가 CAAA

< > 3. Biofiltration



biofiltration

가

CAAA

system

biofilter

V.

가 , , 가

가 biofiltration

biofiltration

(1) , ,

, ,

가

enrichment technique

biofilter

가

biofilter

biofilter가

biofilter

< > 3. *Biofiltration*

(2) 가 가

biofilter , 가
biofilter .
biofilter biofilter

(3) , .
가
biofilter가 .

(4) .
biofilter

< > 3. *Biofiltration*

biofilter

(5)

air sparging, soil stripping,

bioventing

biofiltration

biofiltration

pilot scale

가

가

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3. Biofiltration

1. Biofilter

Aliphatic hydrocarbons			<i>Carboxylic acid esters</i>	
Methane		+	Ethyl acetate	++
Pentane		+		
Hexane		++	<i>Phenols</i>	++
Octane		++	<i>Cresols</i>	+++
Butadiene	+++			
Cyclohexane		+	Sulfur containing compounds	
Aromatic hydrocarbons			Carbon disulfide	++
Benzene		++	Dimethyl sulfide	++
Toluene		++	Thiocyanate	++
Xylenes		++	Thiophene	++
Styrene		+++	Methyl mercaptan	++
Ethyl benzene		+++	Nitrogen containing compounds	
Oxygenated compounds			Amines	++
<i>Alcohols</i>			Amines	+++
Methanol	+++		Pyridine	++
Ethanol		+++	Nitrocompounds	+
Propanol	+++		Acetonitrile	++
Butanol		+++	Isonitriles	++
<i>Ethers</i>			Chlorinated hydrocarbons	
Tetrahydrofuran		+++	Methylene chloride	++
Diethyl ether		+	1,1,1-Trichloroethane	+
Dioxane		+	Trichloroethylene	+
<i>Aldehydes</i>			Perchloroethylene	+
Formaldehyde		+++	<i>Chlorophenols</i>	++
Acetaldehyde		+++	Inorganic compounds	
Butyraldehyde		+++	Hydrogen sulfide	++
<i>Ketones</i>			Ammonia	++
Acetone		++		
Methyl ethyl ketone		++		
<i>Carboxylic acids</i>				
Butyric acid		+++		

< > **3. Biofiltration**

2. Biofilter

	15
	15 - 45°C
pH	6 - 8
	50 - 70%
	80 - 100%
	80 - 90%
	500 m ³ /m ² · h
(1)	0.25 kPa
	1,000 ppm
	200 g/h/m ³
	2 - 5
	0.4 - 0.45 g/mL