



1 ,  
 2 ,  
 3 ,  
 4 ,  
 5 .

\* \*

10 : 20 :  
 30 : 40 :  
 50 : 60 :  
 70 : 71 :  
 80 : 81 :  
 90 :

[ ]

[ ]

가 , 1960

1

가 , 가 가 , 가

1989 가 'Direct Solid-Liquid Separation Using Hollow Fiber Membrane in an Activated Sludge Aeration Tank' ( )  
 (Membrane BioReactor ; MBR)

MBR (Activated Sludge) (MLSS 8,000 - 15,000ppm) ,

Shock Loading), (Bulking), (Foaming) 가 (

, MBR 가 (membrane fouling) .

(driving force)가 , 가 .

(cross-flow) 가 ,

(plasma)

(sludge cake) 가

(Mitsubishi rayon) (Zenon) 가

가 (air)

가 .

( , 가 )가

가 ,

가

가 ( ) , 가 , (maintenance cleaning)

가

, 1992 T.Ahmed 'Use of Sealed-end Hollow Fibers for Bubbleless Membrane Aeration : e  
xperimental studies' , 가

(Toray) JP11128692 (Kuraray) JP10202270, 2001-112

874 2002-39383

가 , 가 ,

가

가

가

가



가 , 가 .

,  
 ,  
 ,  
 ,  
 ,  
 ,  
 2  
 ,

,  
 ,  
 ,  
 가

(ethylene vinyl acetate)

80%

가



(30) (20) (20) (40) (20) (50) .

1) (polysulfone) .

2) (20) (10) ( )가 (10) (50) .

(40) (20) (30) (20) .

3) (60) (20) (40) , (20) (40) .

1 (60)가 6 (10) 6 .

(10) (10) 가 (60) (10) 가 , .

, (50) (10) (10) (10) (40) (60)가 (10) (10) (10) (10) .

0) (60) , (20) .

4) (70) PVC , (10) .

(70) (10) , (20) (60) .

(10) (70) (71)가 (70) .

(71) (71) .

(70) (70) (10) (50) (70) (10) .

1

[ 1]

	1	2	3	
(m <sup>2</sup> )	100	84	46	22
/ ((m <sup>3</sup> /hr)/m <sup>2</sup> )	0.6-0.8	0.6-0.8	0.7-0.9	0.2-0.3

\* 1

2 가 가

3 가

1 (10) , (70) 가

5)

(10) (10) ( )

(10) (10) 가

(10) (80) , (80) (10)

(10) (81)

(80) (81) (polyurethane) (epoxy)

(81) (10) (melting point) 45 - 60??

(poly ethylene glycol ; PEG) (silicone)

(81) (80) (10)

(10) (81) , (81)

(10) (81)가

(81)

(81)가



(81)가 . (81) (80) (10)

(80)가 가

(81) PEG

2

(81)가 (81)가 (10) (81)가

(10) (81) 가 (80) (81)가

(80)가 (81) (81)

(81)가 (10) (80)가 4 (81)가

(10) (81) (10) (81) (80)

(81)가 (81) (81)

(10) 1 (400m<sup>2</sup>/ )

(81) 가 (81)

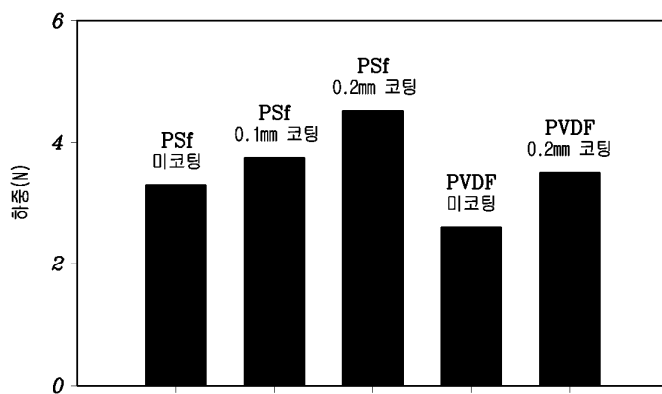
(20)

6) (90) (10) , 가 (10) (

10) (10) (ethylene vinyl acetate)

2 가 가 가 가

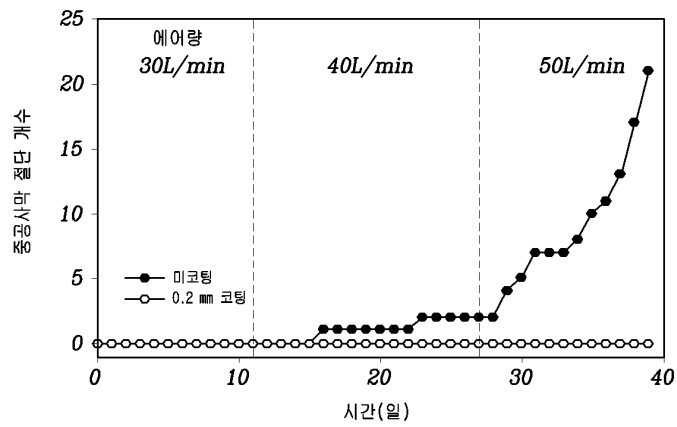
[ 2]



PSf (polysulfone) PVDF (polyvinylidene fluoride)

가 가 가

[ 3]



가 가

5 (90)가 (10) 가

(81)

(80)가 가

(10) (90) (10) (10)

(10) (81)가 (90)가 (10) (90)

(10) (80)가 가 (90)가 (10) (80) (10) 가 (90)

(80)가 (10) (80) (10) 20 - 80% 40

- 60%

4 (10)





가 ,

,

,

2.

1 , .

3.

2 , 가 .

4.

1 , 가 가 .

5.

4 , (poly urethane)  
(epoxy) (rubber) .

6.

4 , 45 - 60?? .

7.

6 , (poly ethylene glycol ; PEG) (silicone) .

8.

1 7 , 가 .

9.

8 , (ethylene vinyl acetate) .

10.

9 , .

11.

9 , .

12.

9 , .

13.

1 20 - 80% .

14.

,

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;

;

가

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15.

14

가

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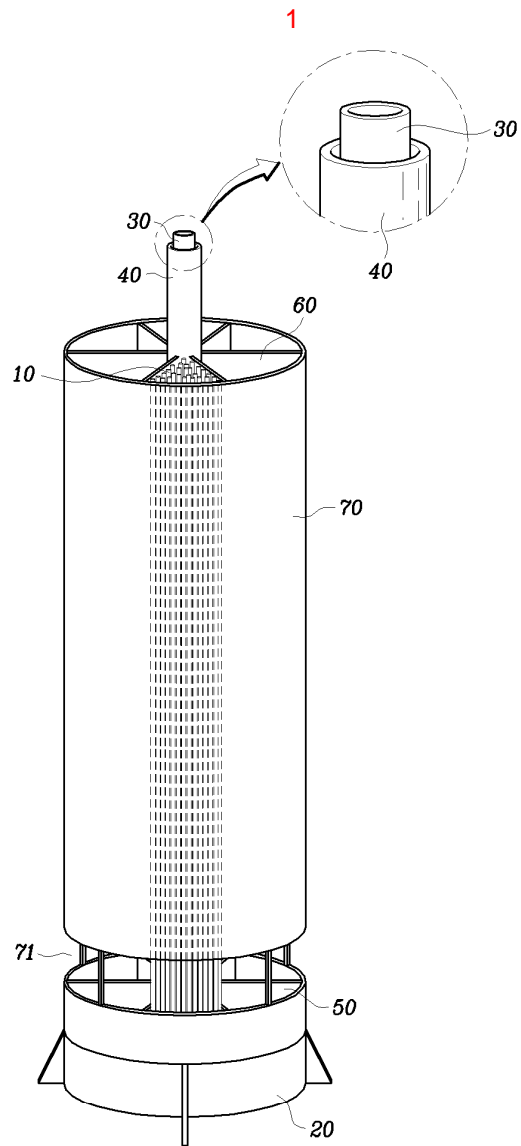
16.

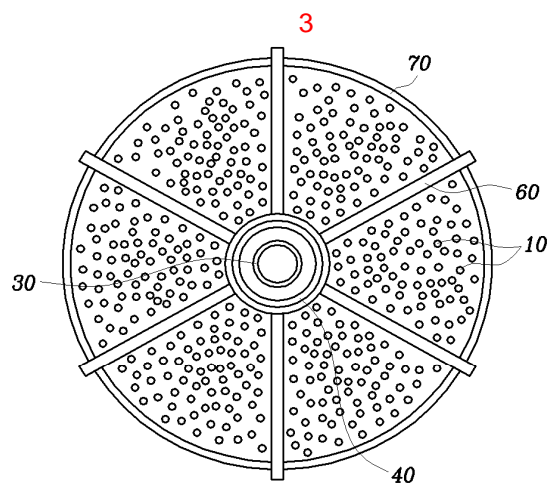
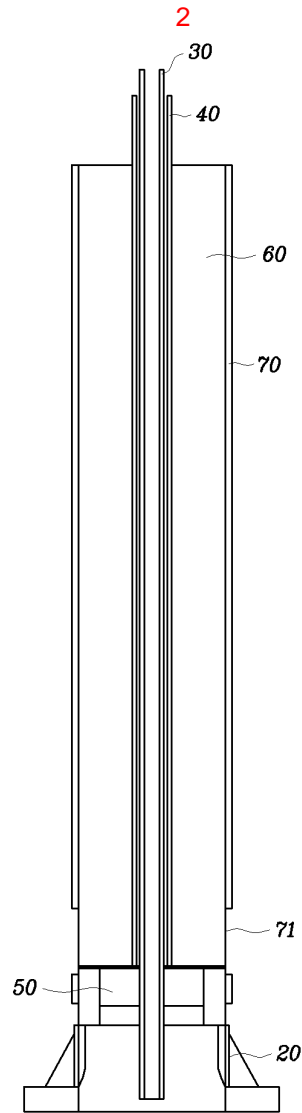
15

,

가 10mm

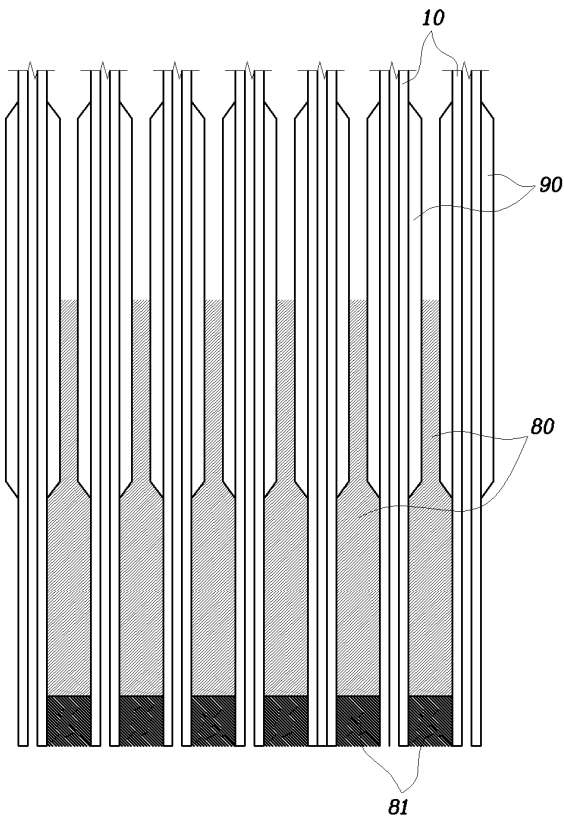
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5

