No Clogging, Smooth Solutions,

目詰まりしない膜分離、スムースな分離精製・水処理

Sepa-Sigma

Development of the New Model of Sewage Treatment Technology at the Test Bed in Water Plaza, Kitakyushu

Dr. Seiichi Manabe, Sepa-Sigma. Inc. President

1 December 2012

Company's Profile

Name	Sepa-Sigma Inc.		
Representative	Dr. Seiichi Manabe		
Establishment	3 August 2006		
Capital Fund	261.75 Million Japanese Yen		
Summary of Business	1. Comprehensive solution provider of purification technology for membrane separation in water treatment, food, overall chemical engineering (R&D) 2. Production and sales of virus removal membrane (filter) and test agent for integrity test of virus removal membrane ＊ Number of patent applications: 53		
Address	1-2-43 Katayama, Wakamatsu, Kitakyushu, Fukuoka 808-0106 Japan		
Telephone	093-791-6875	URL	http://www.sepa-sigma.com

April 2004	Established *Sigma Recycle Technology and Research Institute*. Started development of the pore diffusion flat membrane separation apparatus, as a theme of independent research development.
August 2006	Established *Sepa-Sigma Inc*. and started the commercialization of technologies which has been developed in *Sigma Recycle Technology and Research Institute*.
April 2008	Integrate *Sigma Recycle Technology and Research Institute into Sepa-Sigma Inc.* and has been grown as a R&D enterprise.

Separation Membrane of Sepa-Sigma

1. Long fibered non-woven fabric / Press finish of long fibered non-woven fabric

   Average pore size: 500nm, 1 µm, 10µm, 20µm

2. Long fibered non-woven fabric / Coating of regenerated cellulose multi layered membrane

   Average pore size: 20nm, 80nm, 100nm, 500nm

3. Regenerated cellulose multi layered membrane / regenerated cellulose – Multi layered structure membrane- laminated SESE

   Average pore size: 10nm, 20nm

Test Bed A in Water Plaza Kitakyusyu Research Outline

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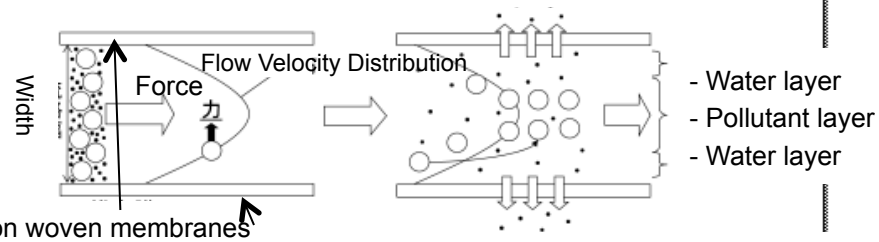
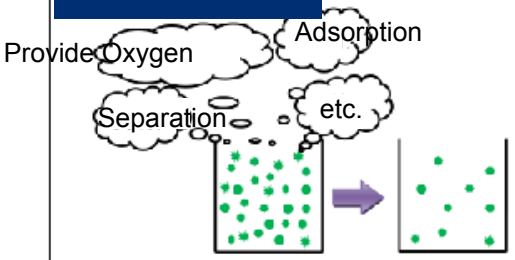
Theme

Development o micro dispersal type sewage treatment apparatus using the flow fractionation type membrane separation module

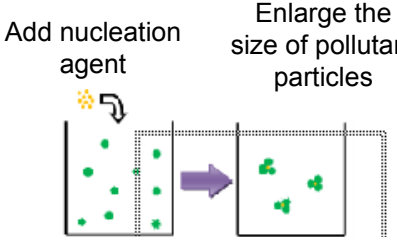
What is the flow fractionation type…..?
Flow velocity distribution occurs in water passage between membrane (wall). Large sized pollution particles concentrate in the center of the flow as you can see in the right drawing). As a result, this water treatment can effectively separate polluted particles from water.



Outline

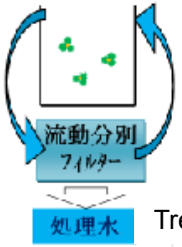


1. Remove pollutants roughly by chemical treatment



2. By adding nucleation agent, enlarge the size of pollutant particles which remained in it.

3. Flow fractionation membrane separation treatment



Flow fractionation filter

Treated water

Development of sewage treatment process without using biological treatment

Research Institution

Industry

SEPARATION × INNOVATION
Sepa-Sigma Inc.
株式会社ケイ・イー・エス
株式会社エイチ・アイ・デー

Academia

- Univ. of Kitakyushu
- Kyushu Institute of Technology

Government

- Kitakyushu Foundation for the Advancement of Industry Science and Technology (FAIS)
- Kitakyushu Asian Center for Low Carbon Society
- Mechanics and Electronics Research Institute, Fukuoka Industrial Technology Center; - City of Kitakyushu

Sepa-Sigma is responsible for this presentation info.

Outline of Development

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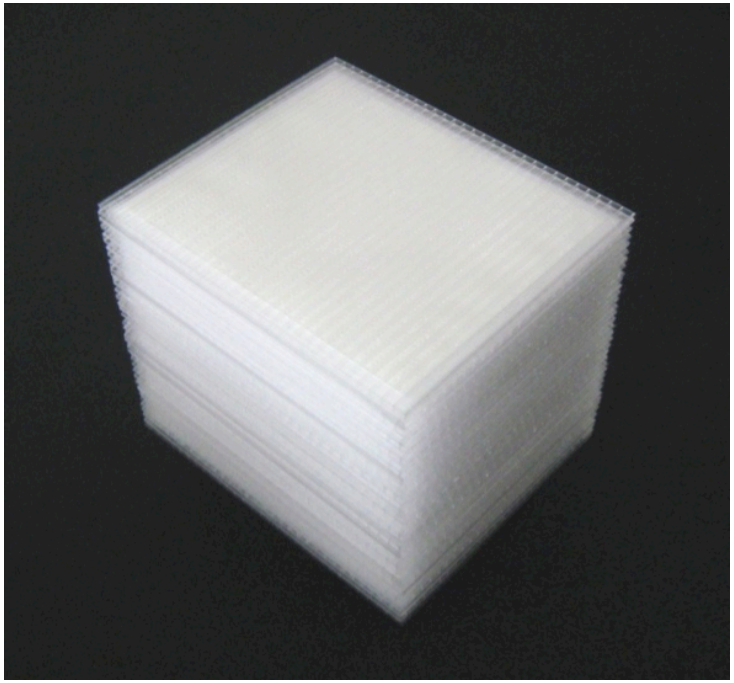
Develop technology to produce final effluents in low cost and stable manner by using a flow fractionation cartridge with low cost membrane.



The Worlds' First
Flow fractionation cartridge

Issues

- downsizing, simplification
- odor
- reduction of cost

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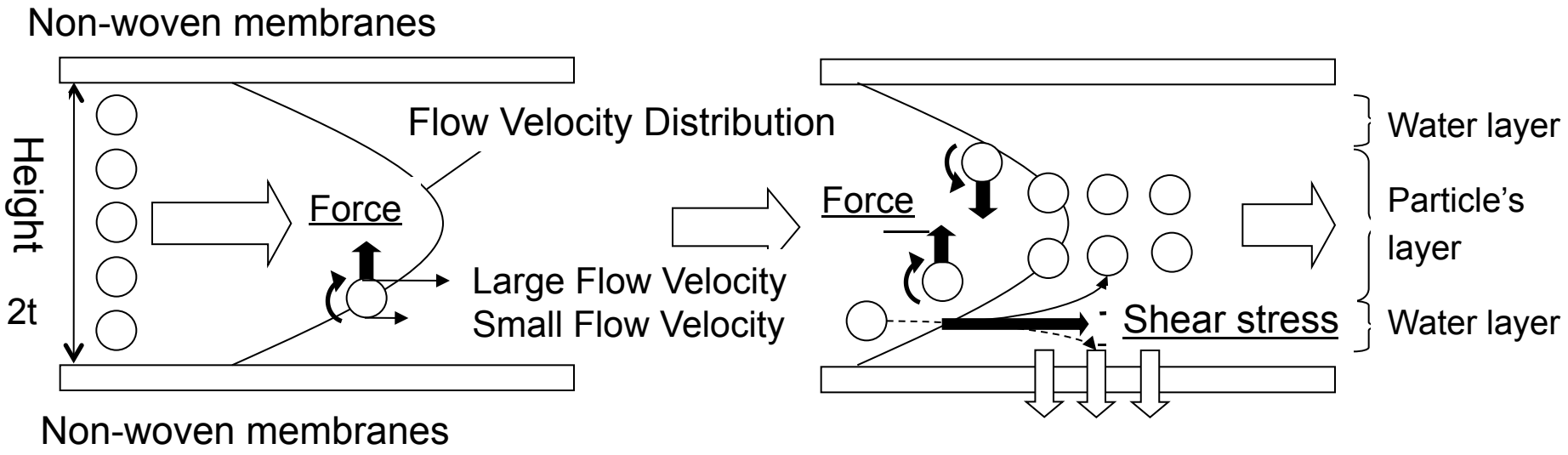
Development of Technologies

- no clogging for long periods
- closed type with odor control
- small dissolution energy
- using low cost non-woven membrane

Flow Fractionation Effect

When liquid is made to flow through passages formed between the membranes (walls), the flow velocity distribution occurs. Particles flowing between different speed of flows, turns around itself and receive force toward the center of the flow (flow fractionation effect).



Patent Application No. 2011-93427

[Flow Fractionation]

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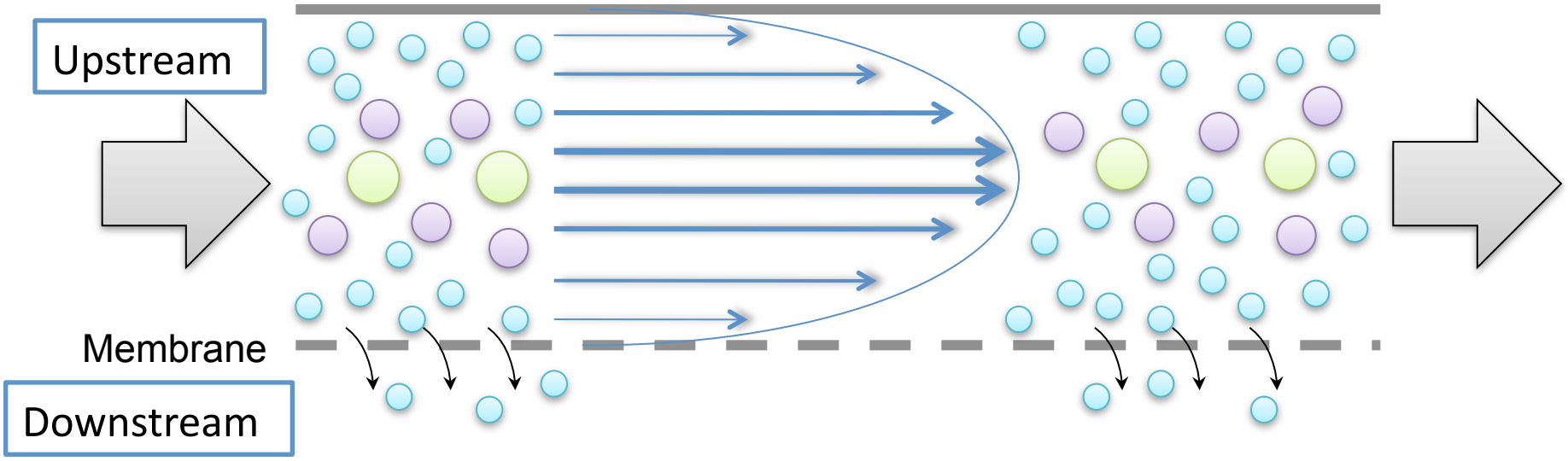
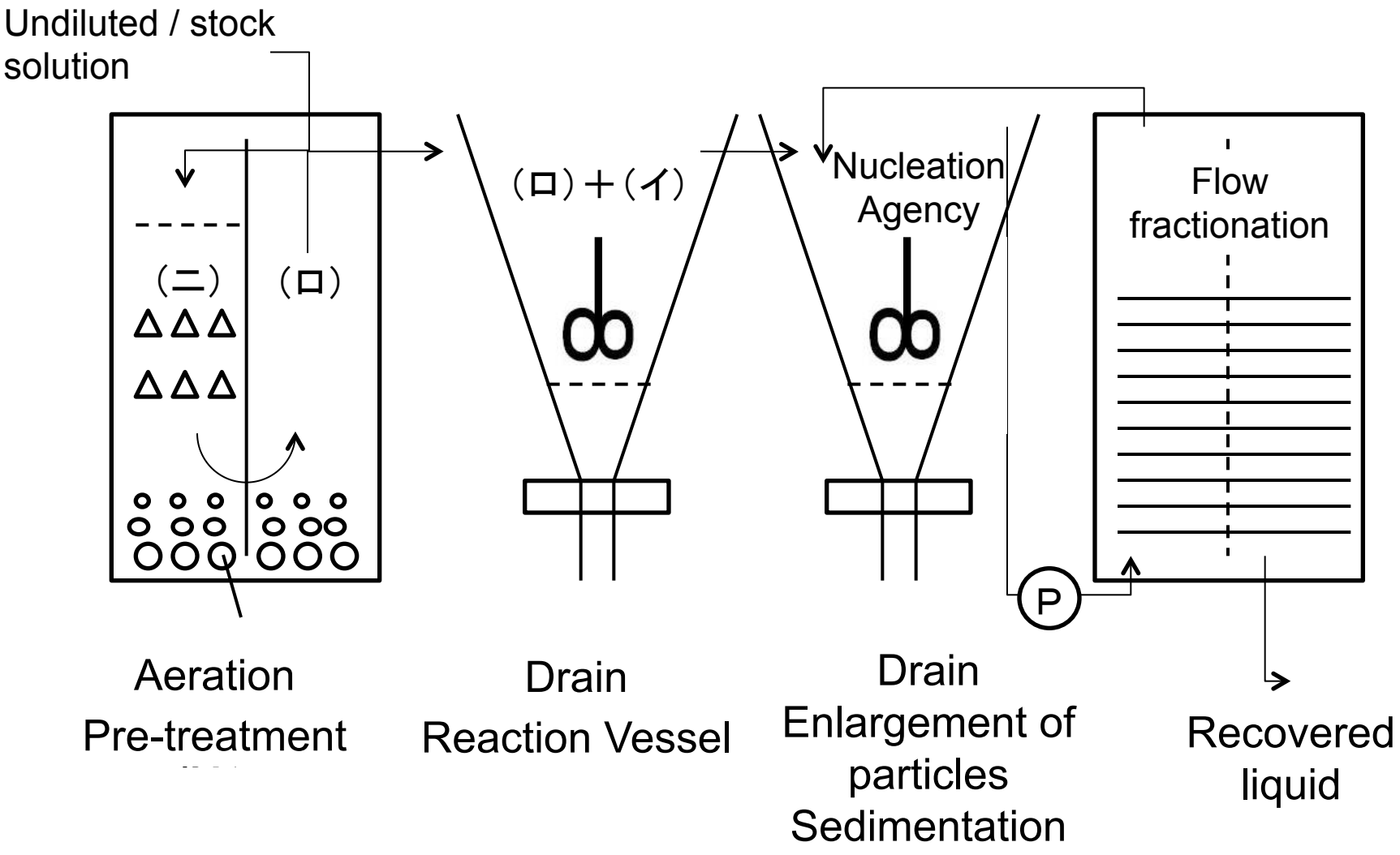


When liquid is made to flow in water passage; theoretically, the flowing speed is faster at the center of the water passage, and flowing speed of membrane side becomes slower. As a result, relatively large sized particles flow at the center and smaller particles flow near the membrane.
By using this phenomenon, infectious agent such as virus are not able to come closer to membrane. Instead, membrane is able to absorb small protein substance effectively. Simultaneously, this separation method can avoid clogging of the pores of membrane.

The pore diffusion method our company uses is a new separation method which we have been studying the conditions of flow fractionation very well. We believe it can achieve the maximum results.

Basic Process

（TOC, COD, BOD, T-N, Heavy Metallic Ion, S, F, B, T-P, SS）



Structure of Nucleation Agent

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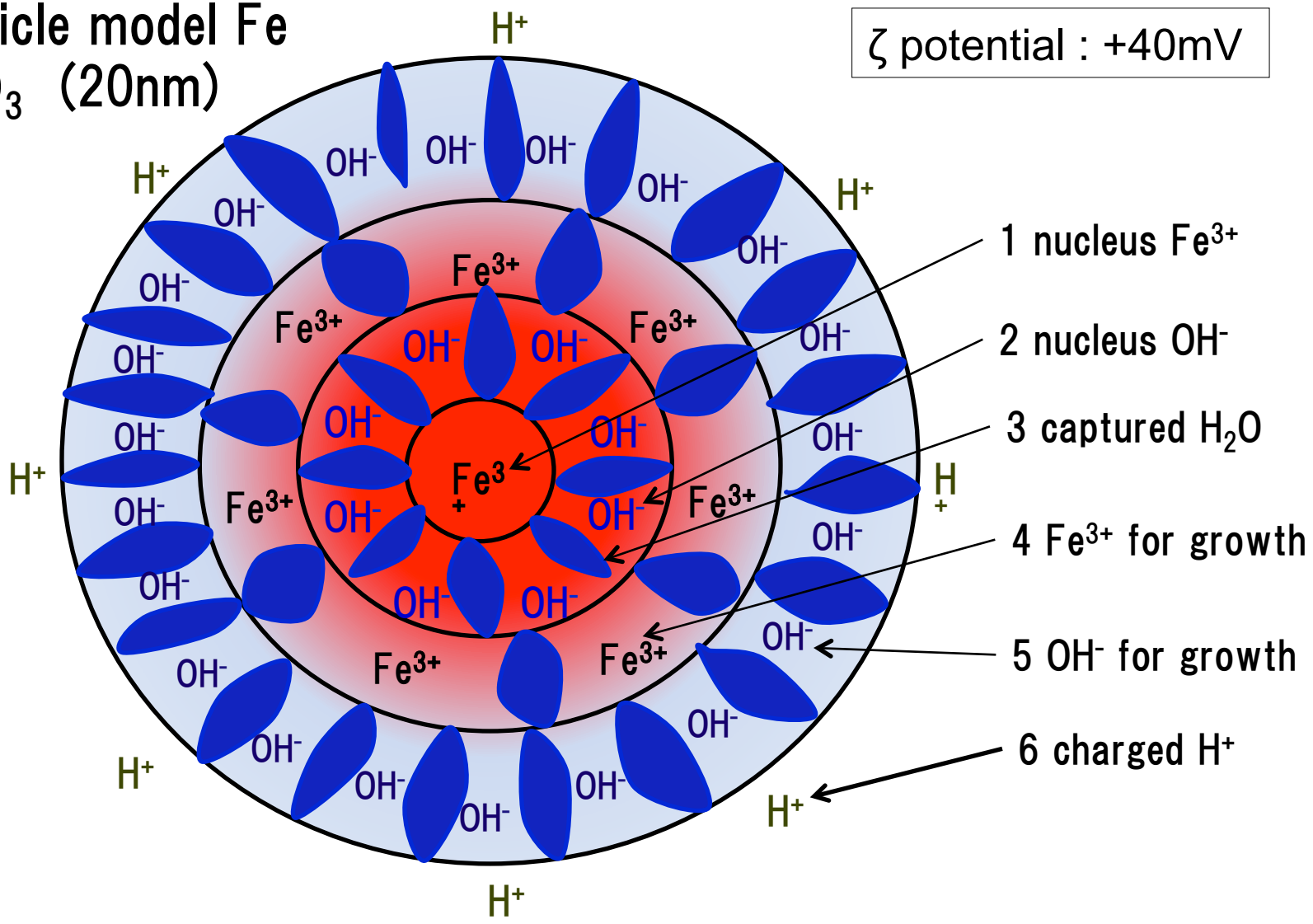
Particle model Fe $(OH)_3$ (20nm)

ζ potential : +40mV



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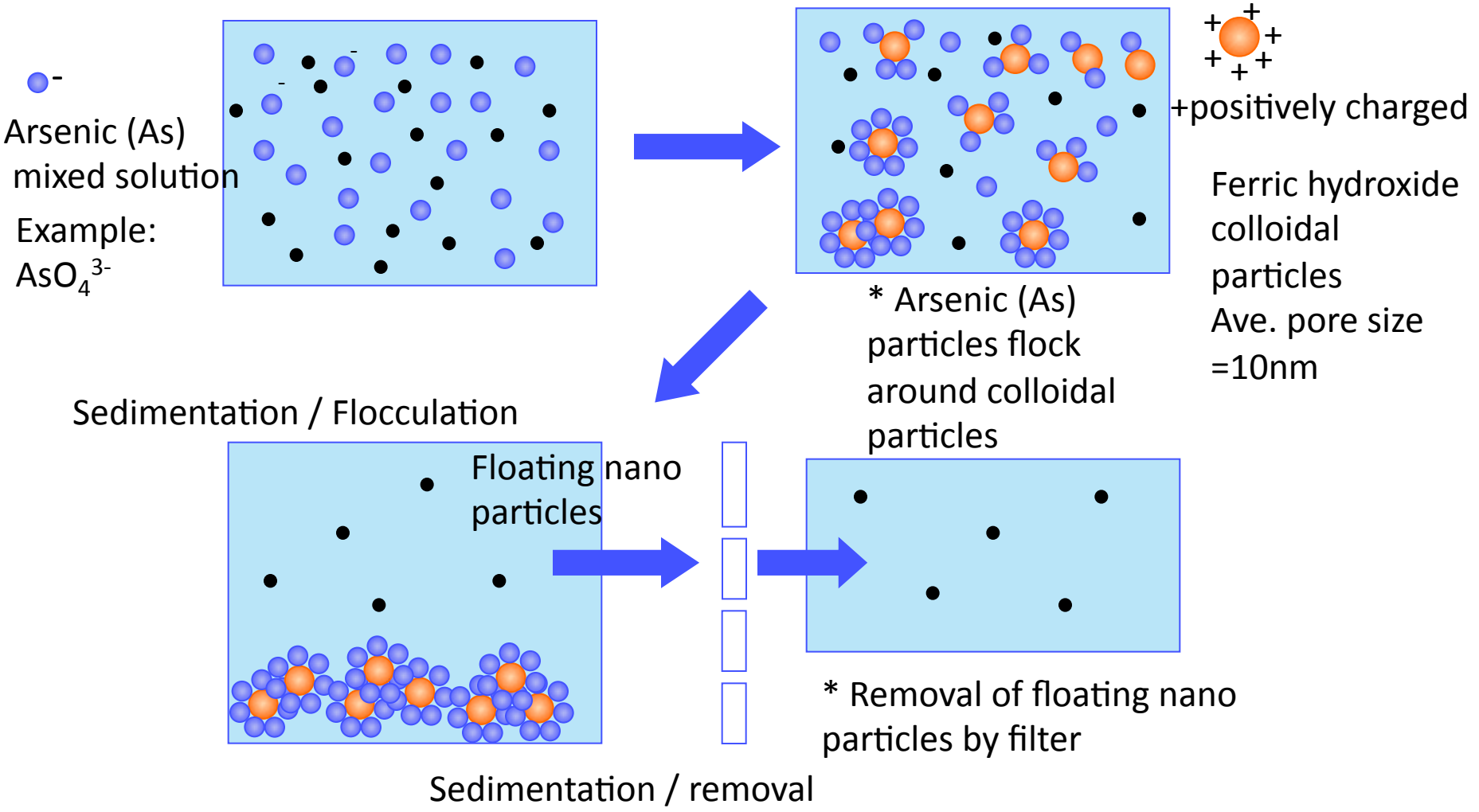
Work of Nucleation Agent



Development Target

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Low cost micro diffusion type sewage treatment apparatus

Nucleating process = Enlarge hazardous particles

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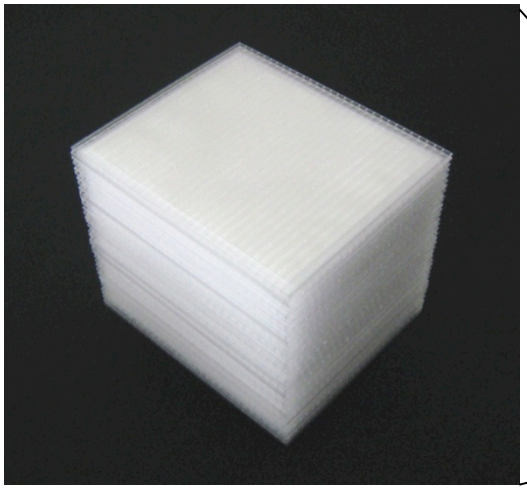
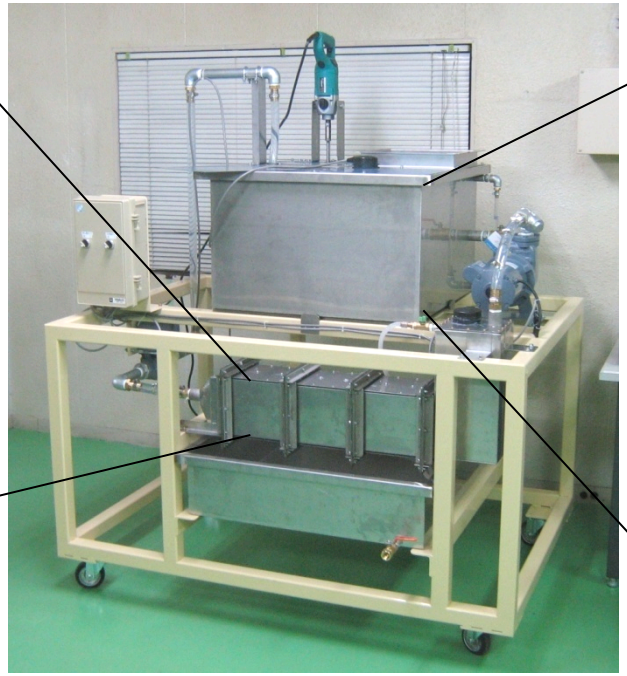
Flow fractionation process = Separate large particles from water

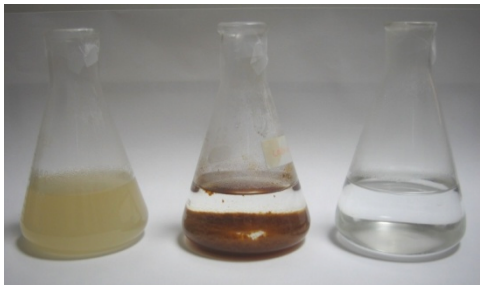
Flow fractionation Cartridge

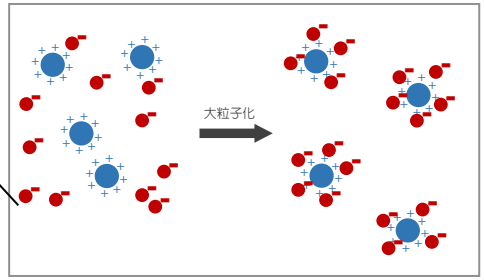


Water treatment apparatus



Enlargement of particles by adding nucleation agent





Technical Target

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	Current value（Average from measured value）	Raw sewage（Average）	Technical target value（standard of discharge water）
COD (mg/L)	<10	110	<10
BOD (mg/L)		200	<2
SS (mg/L)	<1	250	<1
T-N (mg/L)		40	10
T-P (mg/L)		6	0.5
As (mg/L)	0.021		<0.05
Separation Energy			0.1-0.5atm
Treatment speed(LMH)	226		>300LMH
Cost of apparatus 50㎥/day			Approx. 3million Japanese Yen
Frequency of membrane replacement			5 years

Flow fractionation laboratory test

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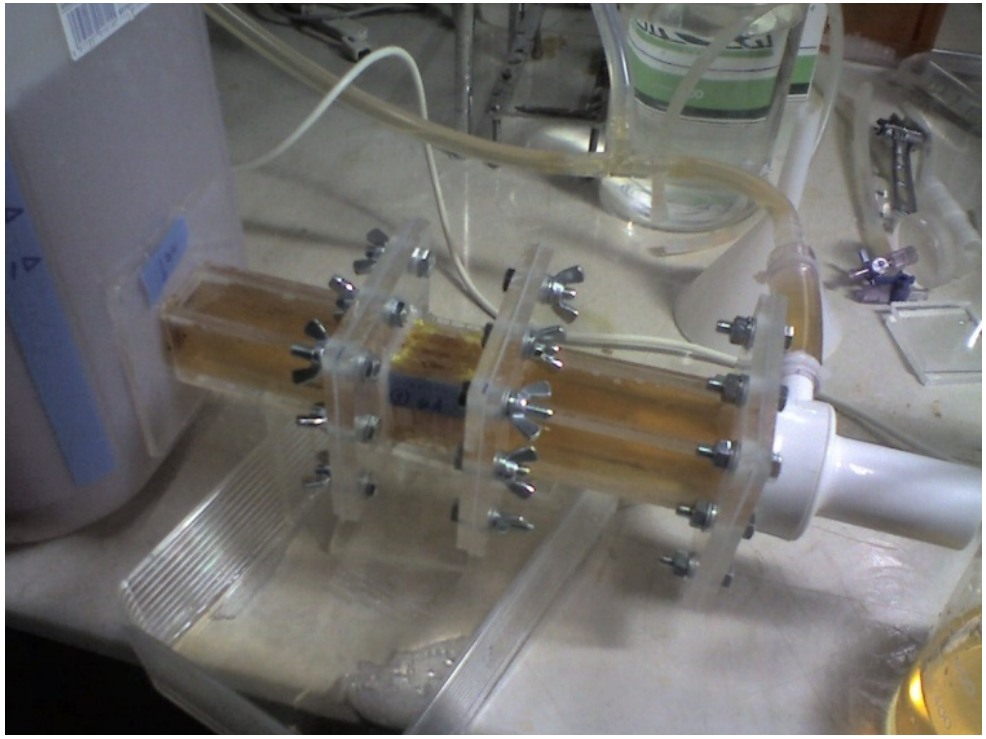
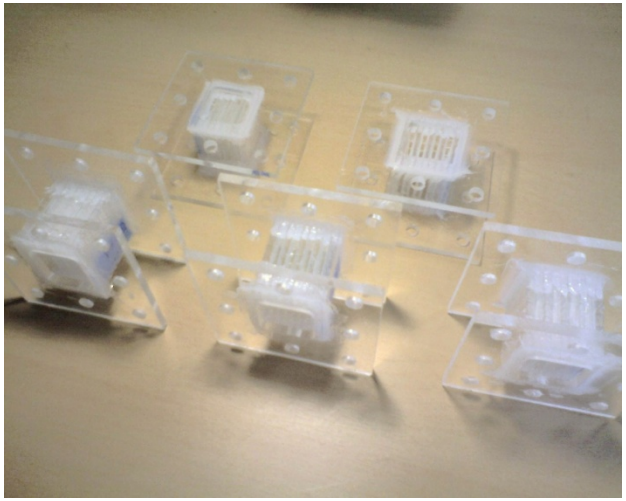




Medium size experiment

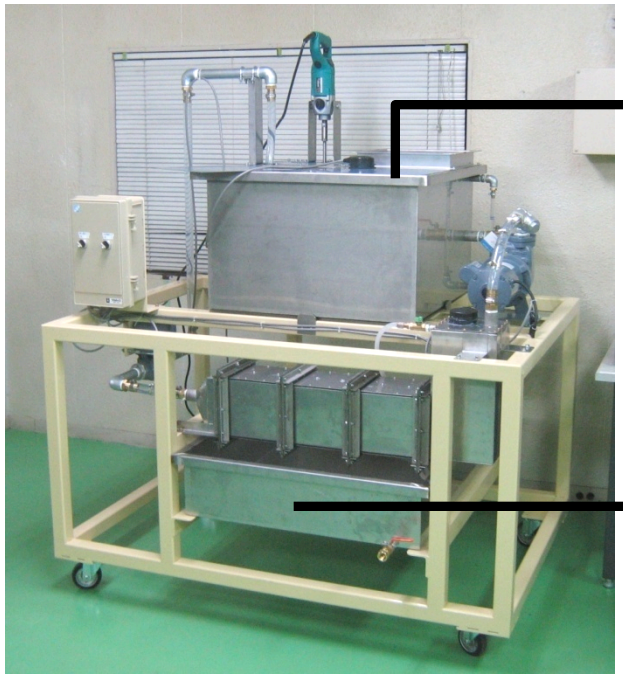
Object：rinse water of waste plastic

Separation particle size >10μm

Pore size of Membrane 10μm; filtration pressure 0.2atm

Flow velocity 2cm/s（strain rate 5/s）

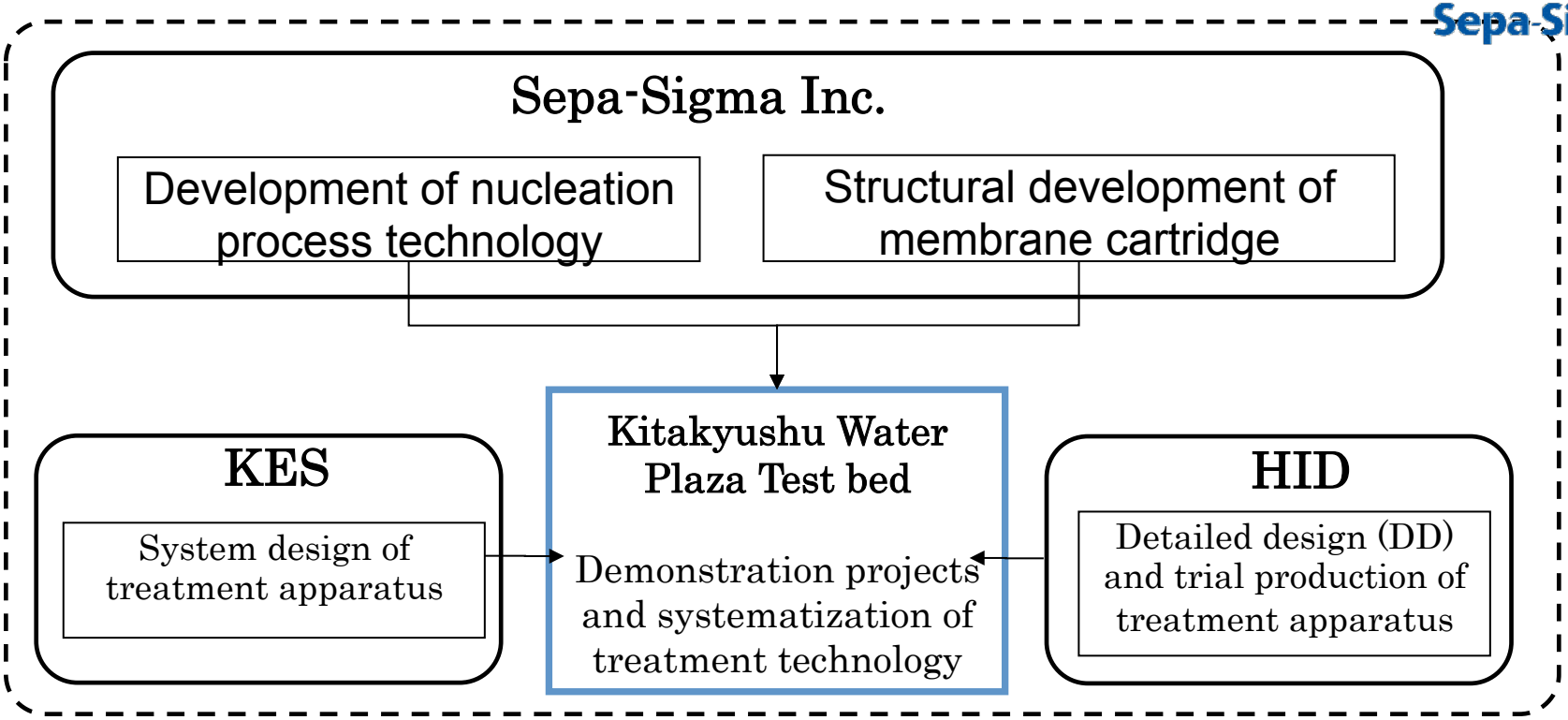
Filtration speed： 15L/min. stable over 12 hours



Enlargement of particles By adding nucleation agent

Treated water

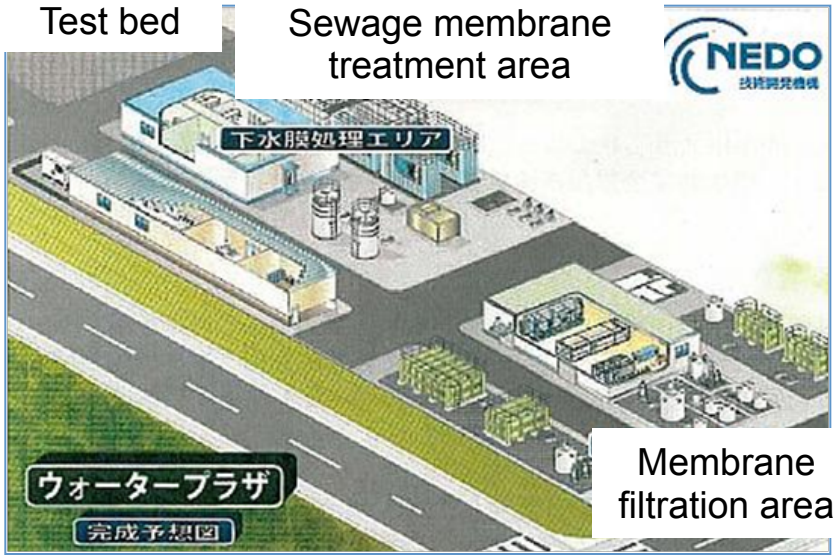
Research system



- City of Kitakyushu; Kitakyushu Foundation for the Advancement of Industry Science and Technology (FAIS)
- University of Kitakyushu, Kyushu Institute of Technology (Technical guidance)
- Kitakyushu Asian Center for Low Carbon Society (Support for commercialization)
- Mechanics and Electronics Research Institute, Fukuoka Industrial Technology Center (Technical guidance);
- Non-woven fabric manufacture (Company A): mass production

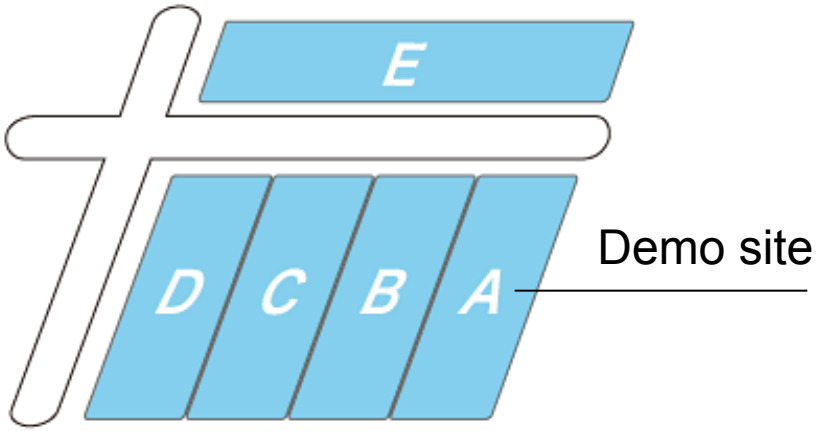
Demonstration Project Site

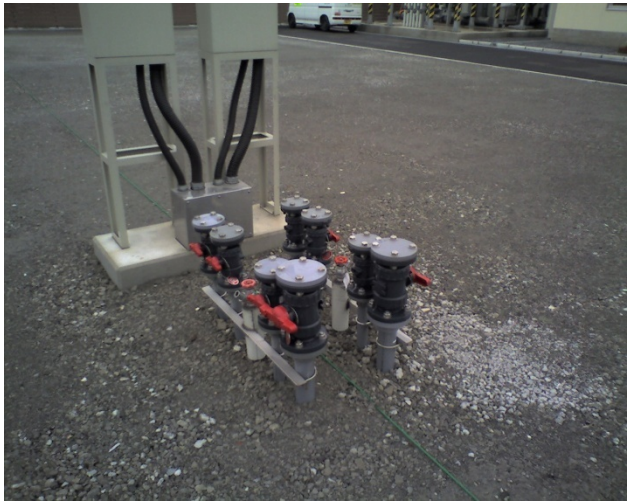
Test bed (site A), Water Plaza Kitakyushu



Water Plaza (Architectural rendering)

- Test bed districts section map





Intake / outlet

Commercialization Plan

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1. Product: Flow fractionation type water treatment apparatus (sewage / drainage treatment)

2. Concept: - Micro membrane distributed type sewage treatment apparatus
   - Small scale (private) sewage treatment apparatus

3. Target market, target size
   Water utilization / treatment market
   Approx. 504 trillion Japanese Yen (2009)
   Expect to grow 878.3 trillion Japanese Yen (2015) which is 72.7% increase from 2008.
   3 years after the commercialization of the products, aim to achieve 0.1% share in water treatment market in the world (600 billion Japanese Yen)

Demonstration Project Sites

Sepa-Sigma

Farmland, islands, disaster stricken area, developing countries

- Micro membrane distributed type sewage treatment apparatus
- Small scale (private) sewage treatment apparatus

1. Independent treatment apparatus
2. Adopt the technology in the water recirculation system using oxidation ditch method.

Capable to use existing facilities (water passage and propeller) so that initial cost can be reduced.

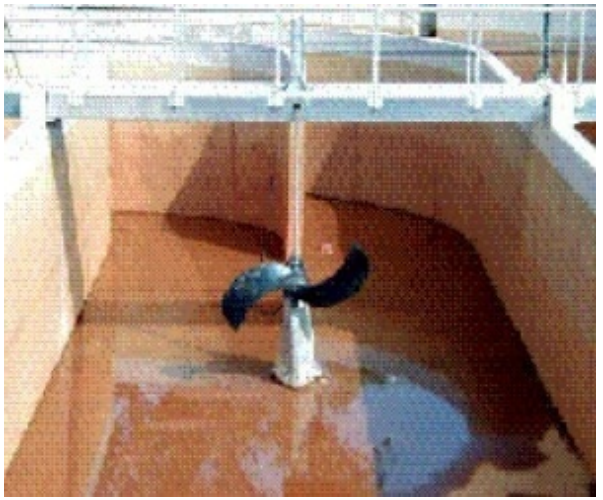
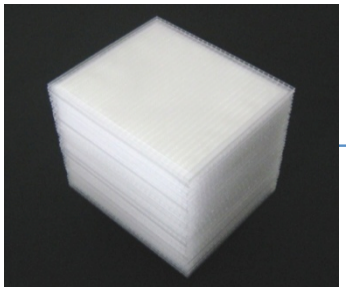
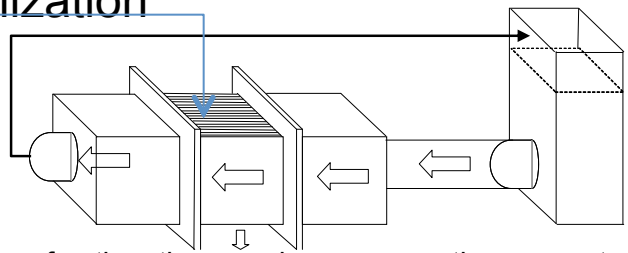


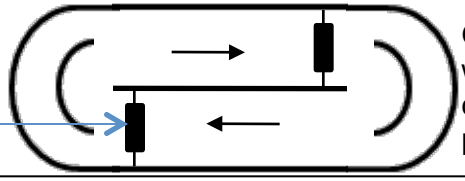
Image of commercialization



Flow fractionation cartridge



Flow fractionation membrane separation apparatus



Oxidation ditch water re-circulation pond

Contribution to International Society

Utilization of water resources corresponding to the climate change

・Rapid development in developing countries and immediate installation of sewage treatment.

・Move to decentralized cities, use for disaster prevention measure

Adopt technology, especially for the arsenic issues in ground water.

Industrial effluent treatment, air pollution measurement

・Environmental technology can be adopted in manufacturing industries in Kitakyushu

・Plan speedy commercialization by cooperating with industry, academy and government, such as with Kitakyushu Oversea Water Business Association; and Kitakyushu Asian Center for Low Carbon Society