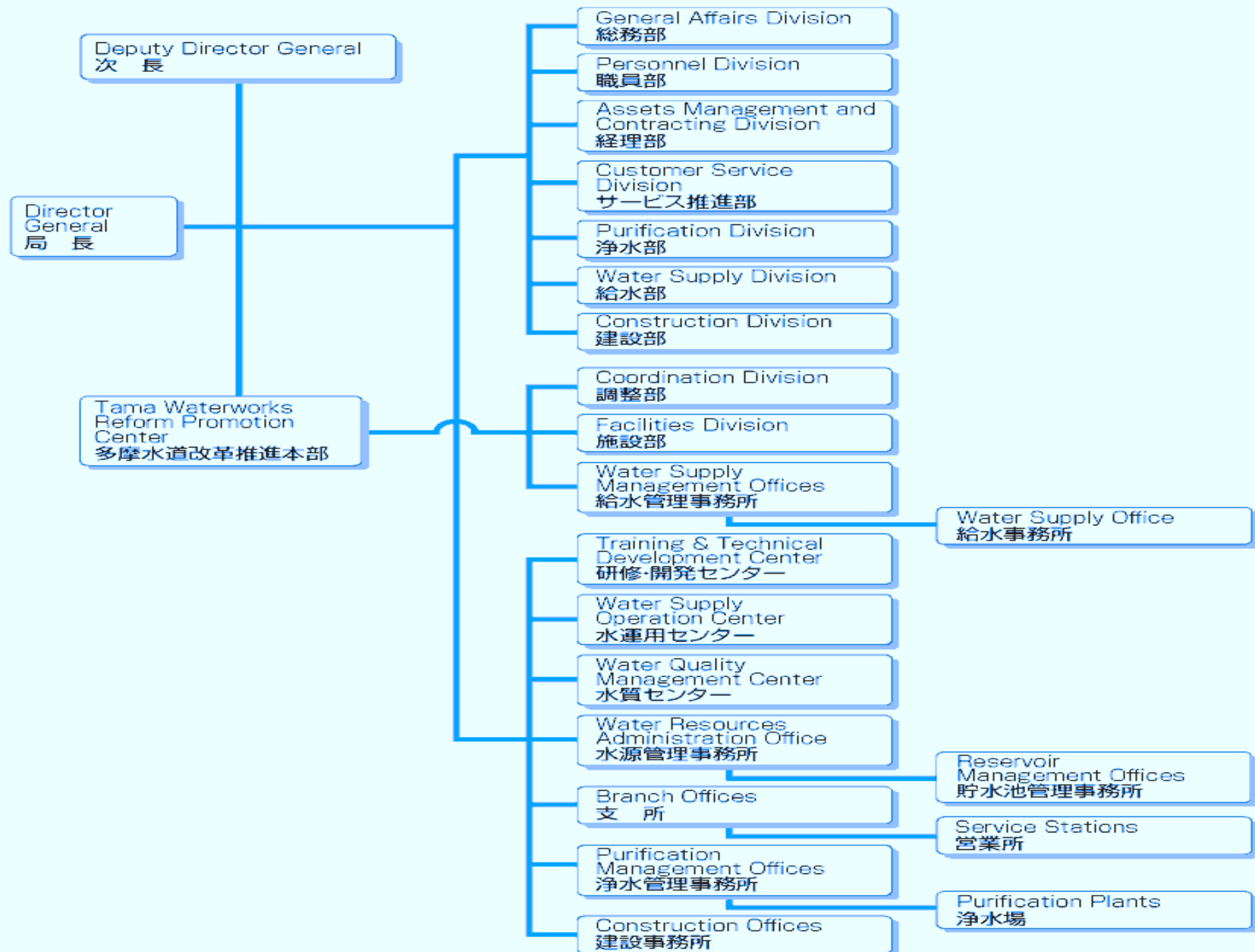




Water quality control in Japanese treatment plants

Compiler :
DR.HOSSEIN MOHAMMADNIYA



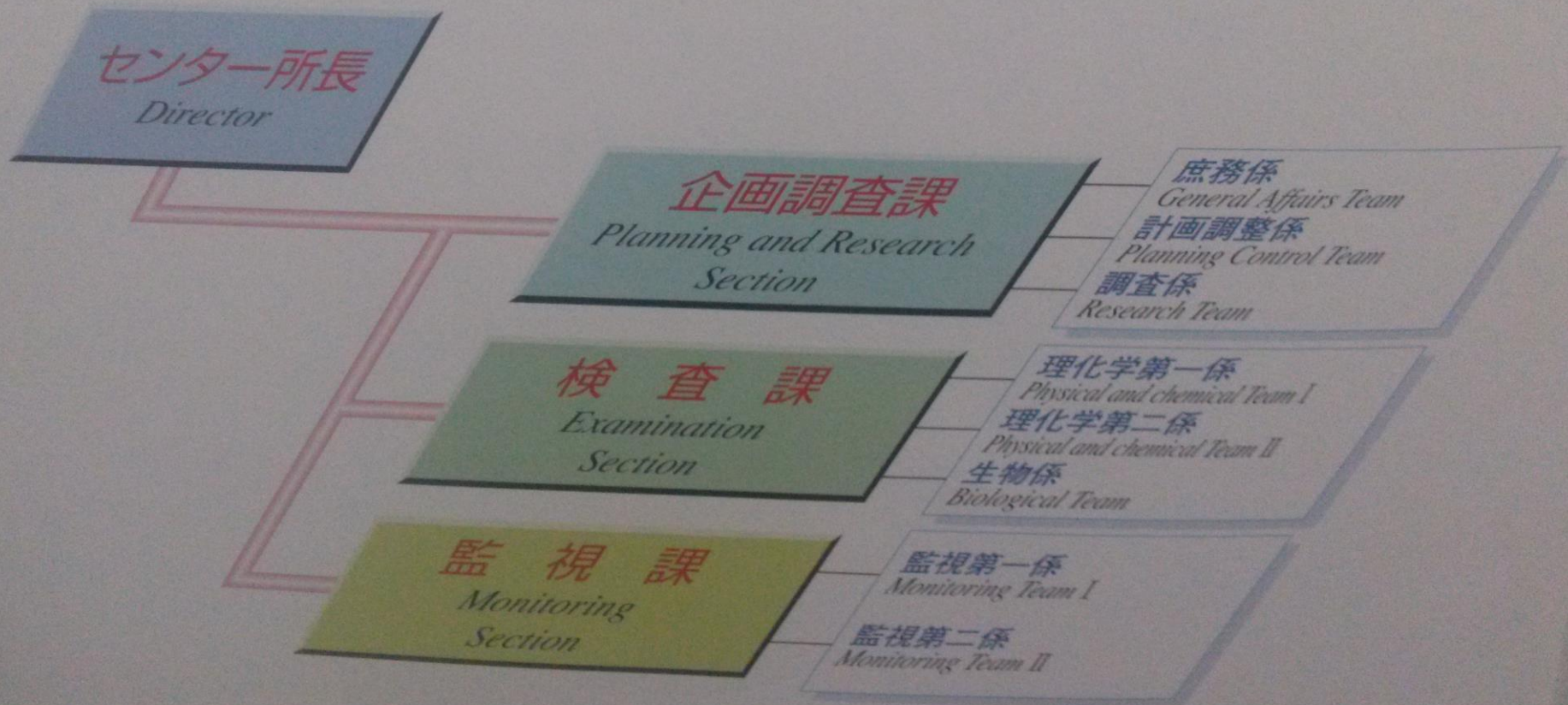
Water Quality Management Center

1. Surveying and Monitoring Water Sources
2. Examination of the water brought from Purification Plants
3. Management of the Tap Water Quality
4. Dealing with Accidents Concerning the Water Quality
5. Research and Development
6. Others

چارت سازمانی

水質センターの組織と業務

Organization chart and Duties of Water Quality Management Center





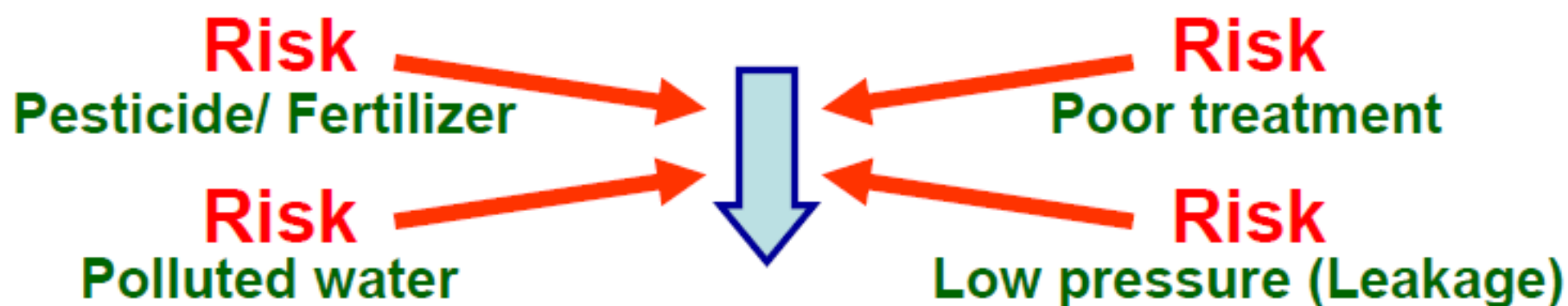
Creation of Drinking Water Safety Plan (DWSP / WSP)

Ken Yokoyama (Mr.)

Yokohama Water Co., Ltd.

Water Supply Condition

The water supply in Japan, it secures safety water supply with maintenance and management of water supply system according to satisfy the water quality standard.



There are various risks, have accidents or damage caused taste and odor pollution.

Actions of WHO

WHO (World Health Organization) introduced an idea of HACCP* had already established in food manufacturing field.

*** Hazard Analysis and Critical Control Point**



WHO has proposed WSP (Water Safety Plan) that conducted risk assessment and management at every stage from water source to tap, and it is to build water system to ensure safe water supply.**

**** Guidelines for Drinking-Water Quality / 3rd Edition / 2004**

Misono purification plant

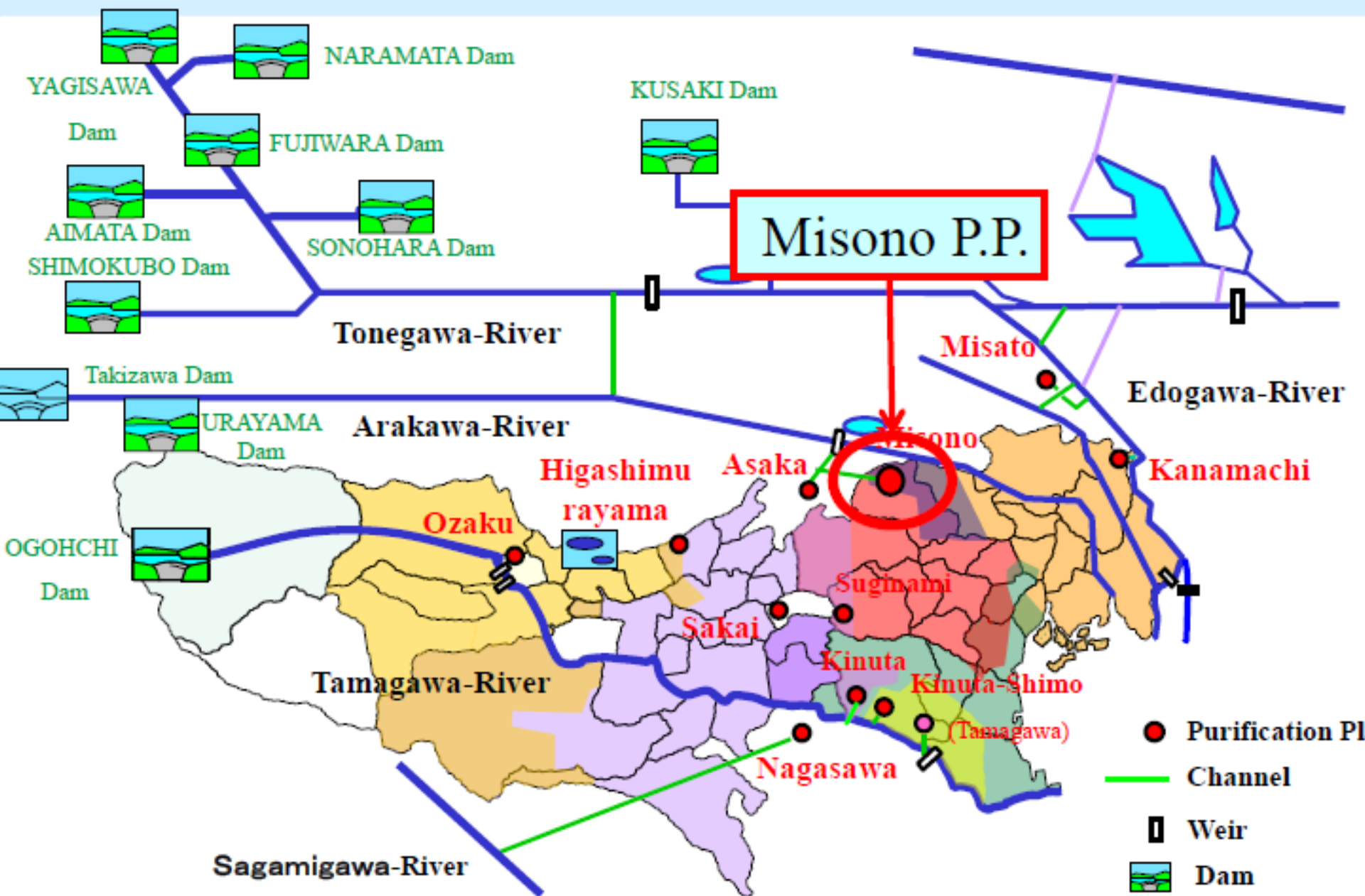


Welcome to Misono Purification Plant

Outline of Tokyo Waterworks

Service area	(km ²)	1,235
Population served	(persons)	1,287,900
Pervasion rate	(%)	100
Total capacity of facilities	(m ³ /day)	6,860,000
Ave. distribution amount per day	(m ³ /day)	4,160,000
Total length of distribution pipes	(km)	26,490
Number of staff	(persons)	3,888

Resource and Purification Plants



Overview of Purification Plant Facility

Water System	Plant	Capacity (m ³ /Day)	Ratio (%)		Processing method
			By plant	By system	
Tone/ Arakawa Water system	Kanamachi	1,500,000	21.9	79.9	Advanced water treatment system
	Misato	1,100,000	16.0		
	Asaka	1,700,000	24.8		
	Misono	300,000	4.4		
	Higashi-murayama	880,000	18.4		
	385,000				
Tamagawa Water system	Ozaku	280,000	4.1	17.0	Rpid Filtration Method
	Sakai	315,000	4.6		Rpid Filtration Method
	Kinuta	114,500	1.7		Slow Sand Filtration Method
	Kinuta shimo	70,000	1.0		Membrane Filtration Method
	Tamagawa	(152,500)			Membrane Filtration Method
					Rpid Filtration Method
SAGAMIGAWA	Nagasawa	200,000	2.9	2.9	Rpid Filtration Method
Groundwater	Suginami	15,000	0.2	0.2	Sanitization only
Total		6,850,500	100.0	100.0	—

Misono Purification Plant



Arakawa river
荒川

Site area: 97,363m²

History of Misono Purification Plant

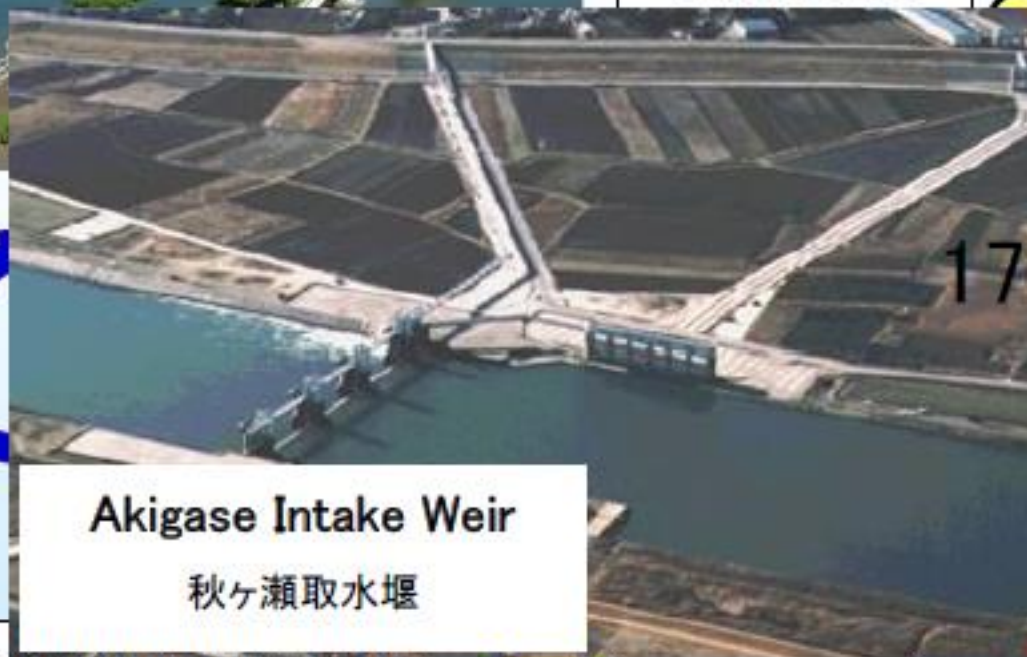
- 1967 : Started construction of facilities for industrial water supply.
- 1971 : Industrial water supply service started.
(350,000m³/day → 175,000m³/day)
- 1973 : Started construction of facilities for public water supply.
- 1975 : Public water supply service started.
(300,000m³/day)
- 2007 : Advanced water treatment system started.

Raw water connecting pipes

Higashimurayama • Yamaguchi
Reservoir



Hamura
Intake Weir

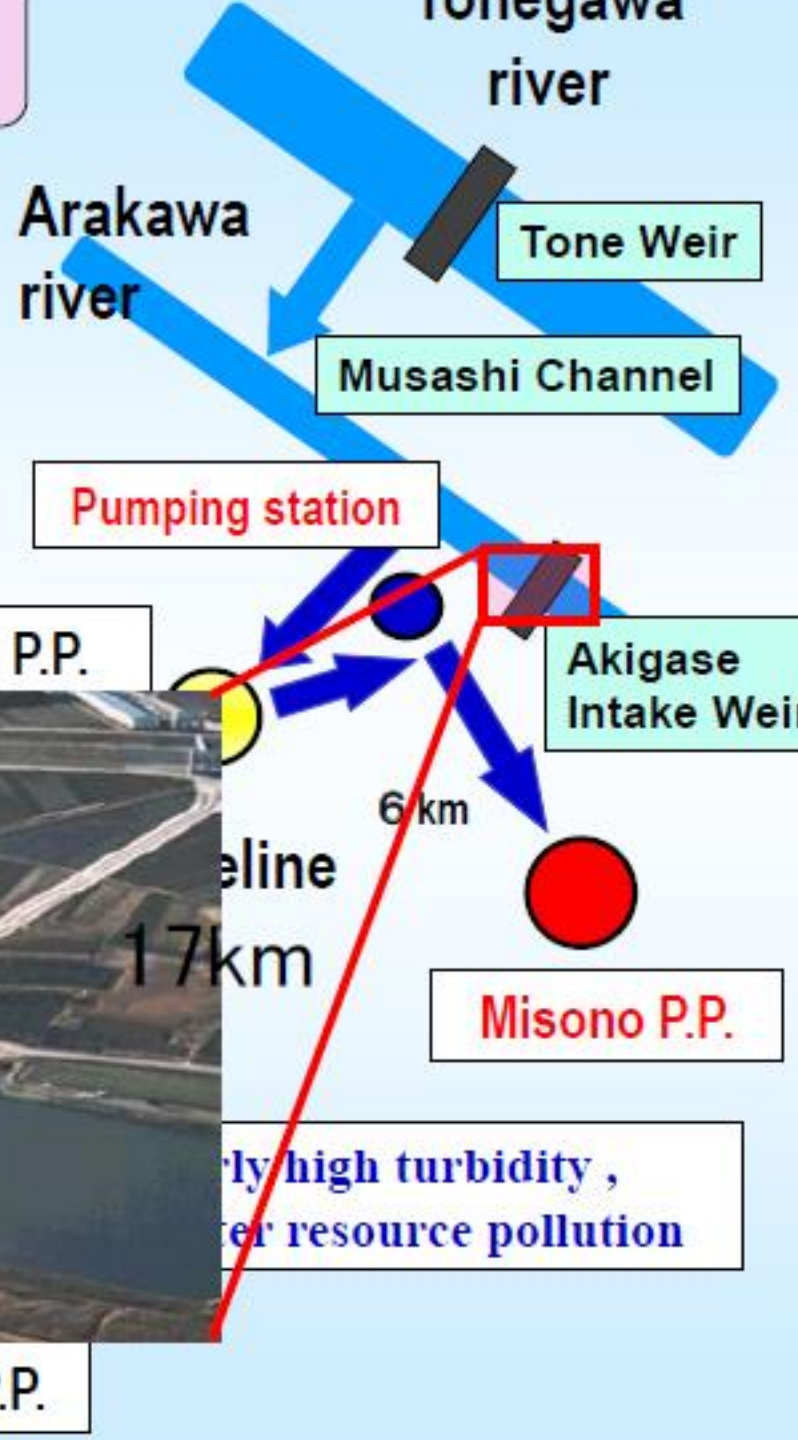


Akigase Intake Weir
秋ヶ瀬取水堰

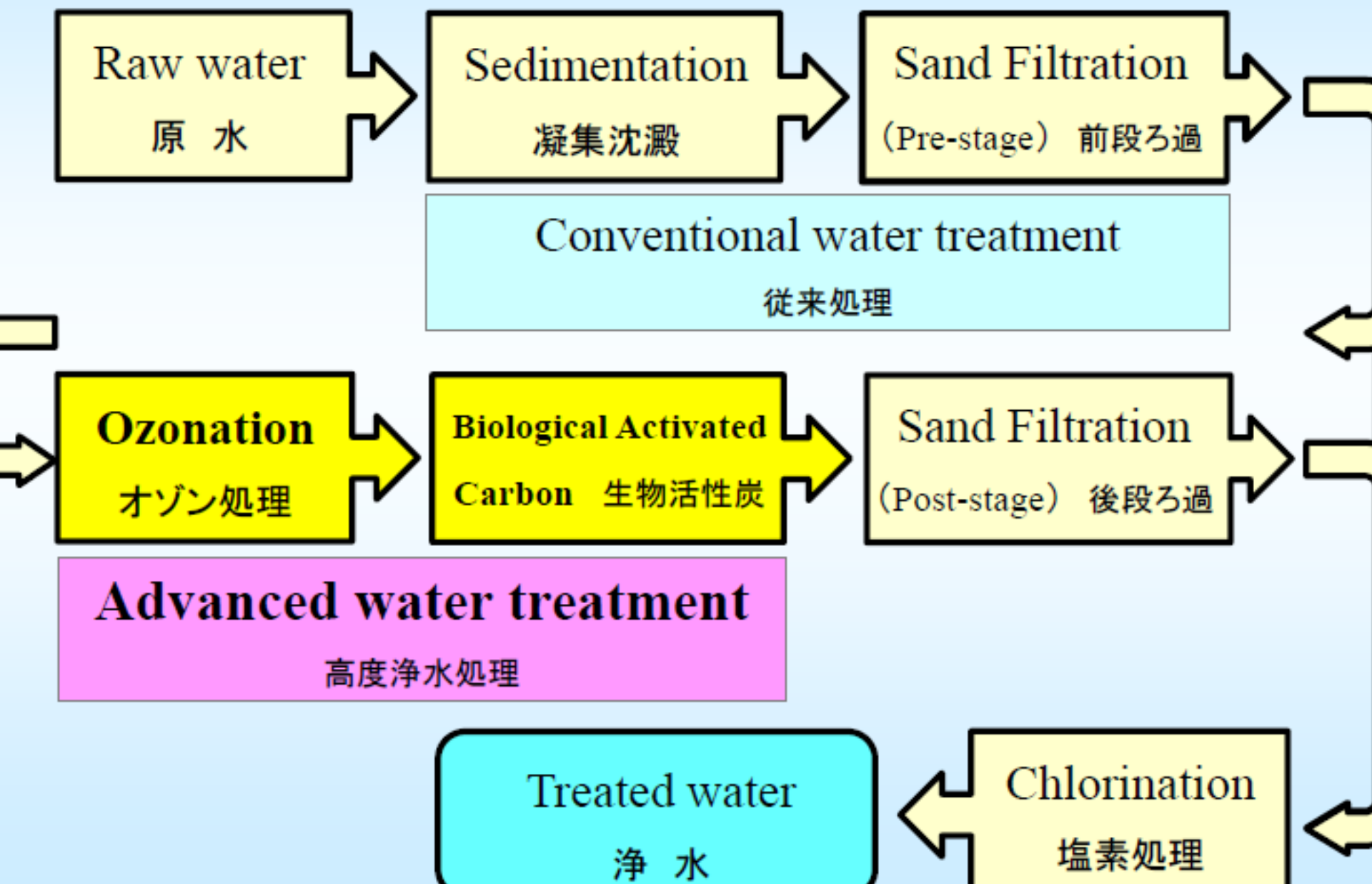
Higashimurayama P.P.



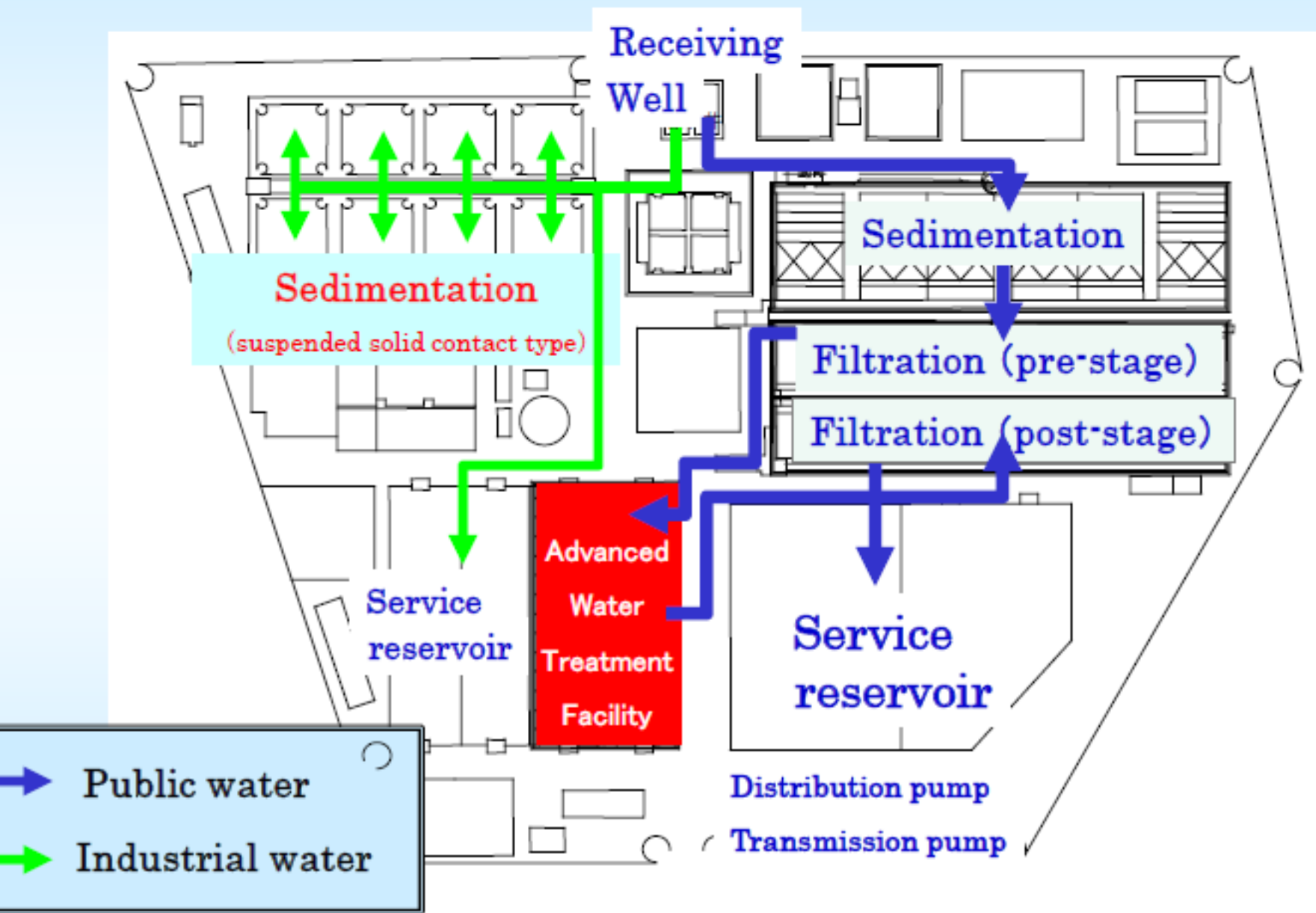
Sakai P.P.



Treatment Process of Misono P.P.



Water flow of Misono P.P.



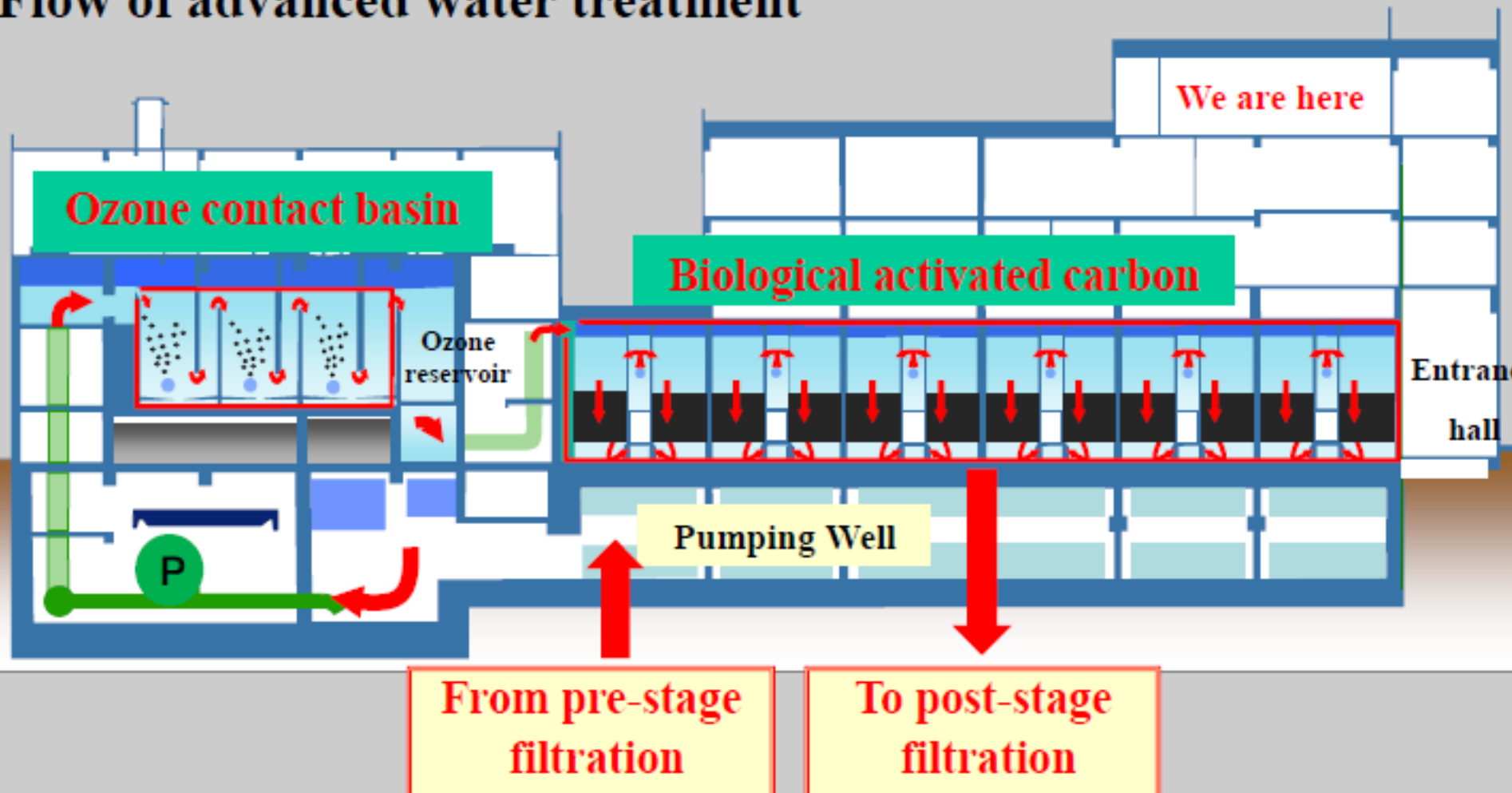
Purpose of advanced water treatment

To remove

- ① substances that cause a musty odor
- ② ammonium that cause a bleach odor
- ③ substances that form trihalomethane

Advanced water treatment facility

Flow of advanced water treatment



Ozone Generator



Number	4
Material	Air
Capacity	7 Kg O ³ /h
Concentration of O ³	25 g/Nm ³
Ozone as air volume	280 Nm ³ / h

ازن زنی در تصفیه خانه میسونو



Ozone (O_3) contact basin

Pre-stage rapid sand filters

前段ろ過池

Decomposition of Odor and Organic Substances
Increase of Dissolved Oxygen
Increase of biodegradability

O_3

Air including Ozone

(O_3 : 2%)

4min.

4min.

4min.

7min.

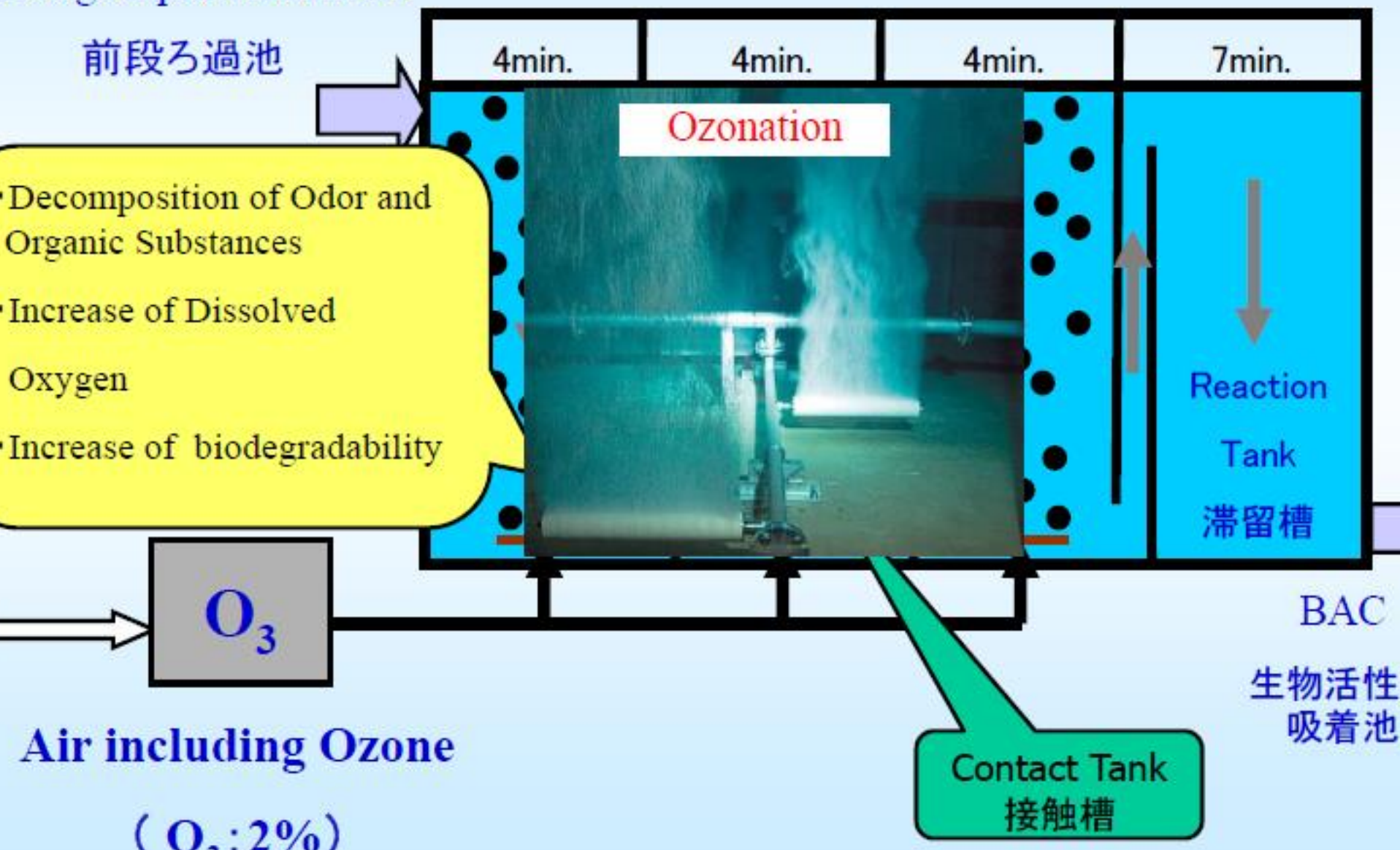
Ozonation

Reaction
Tank
滞留槽

BAC

生物活性
吸着池

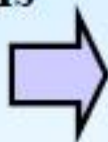
Contact Tank
接触槽



Biological Activated Carbon

zone contact basins

オゾン接触池



BAC
(enlargement)

Activated Carbon

活性炭

- Absorbing Odor and Organic Substances

無数の小さな穴で臭いや有機物を吸着

- Specific Surface Area

$1,000\text{m}^2 / 1\text{g}$



Microorganism

微生物

- Elimination of Odor and Organic substances

臭いや有機物を分解

- Making longer duration time of carbon

活性炭の目詰まりを防ぐ

- Nitrification

アンモニアを除去(硝化)

Post-stage rapid
sand filters

後段ろ過池



Safe , better tasting water

カルキ臭のないおいしい水

Water Examination

Water examination room



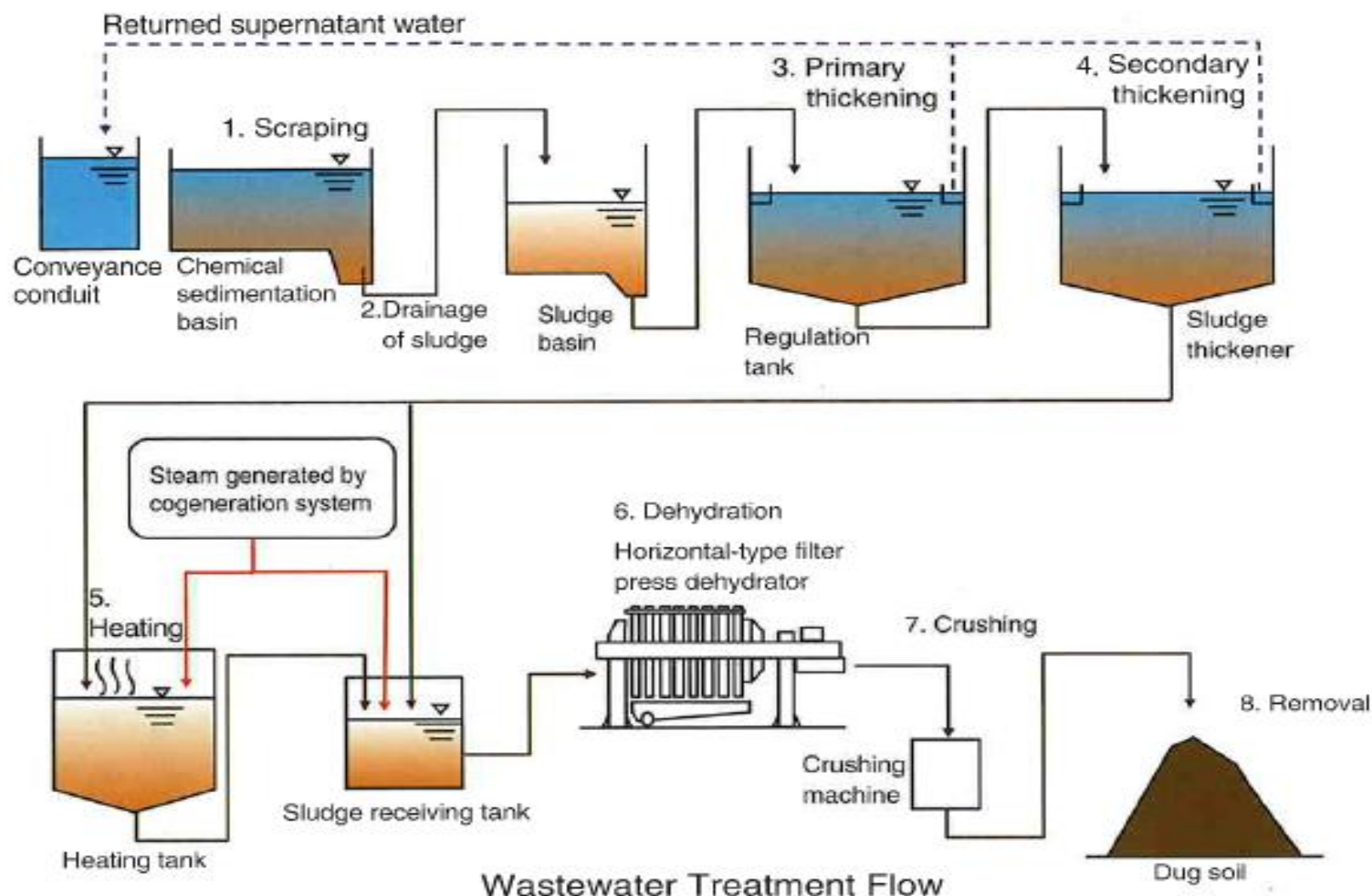
Automatic water quality monitoring



Central Control Room



دفع پساب زلال ساز و فیلتر

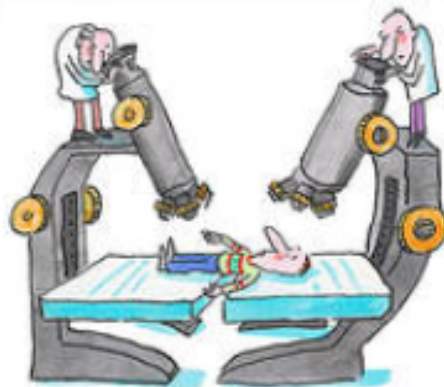


Human resource of water quality division

② Inspection section

10 staffs

- Water quality inspection of fixed sampling points where water source, tap water, purification plant.
- Other water quality inspection as, water source pollution, customer's request.



ISO9001

ISO/IEC17025

Analytical instruments for inorganic analysis



ICP-MS

Inductively coupled plasma mass spectrometer

Object: metal and non-metal element

Ion chromatograph →

Object: ammonia, chloride, nitrate, nitrite, sulfate, chlorate, bromate, etc.



Analytical instruments for organic analysis

LC-MS

Liquid chromatograph mass spectrometer

Object: pesticide



GC-MS

Gas chromatograph mass spectrometer

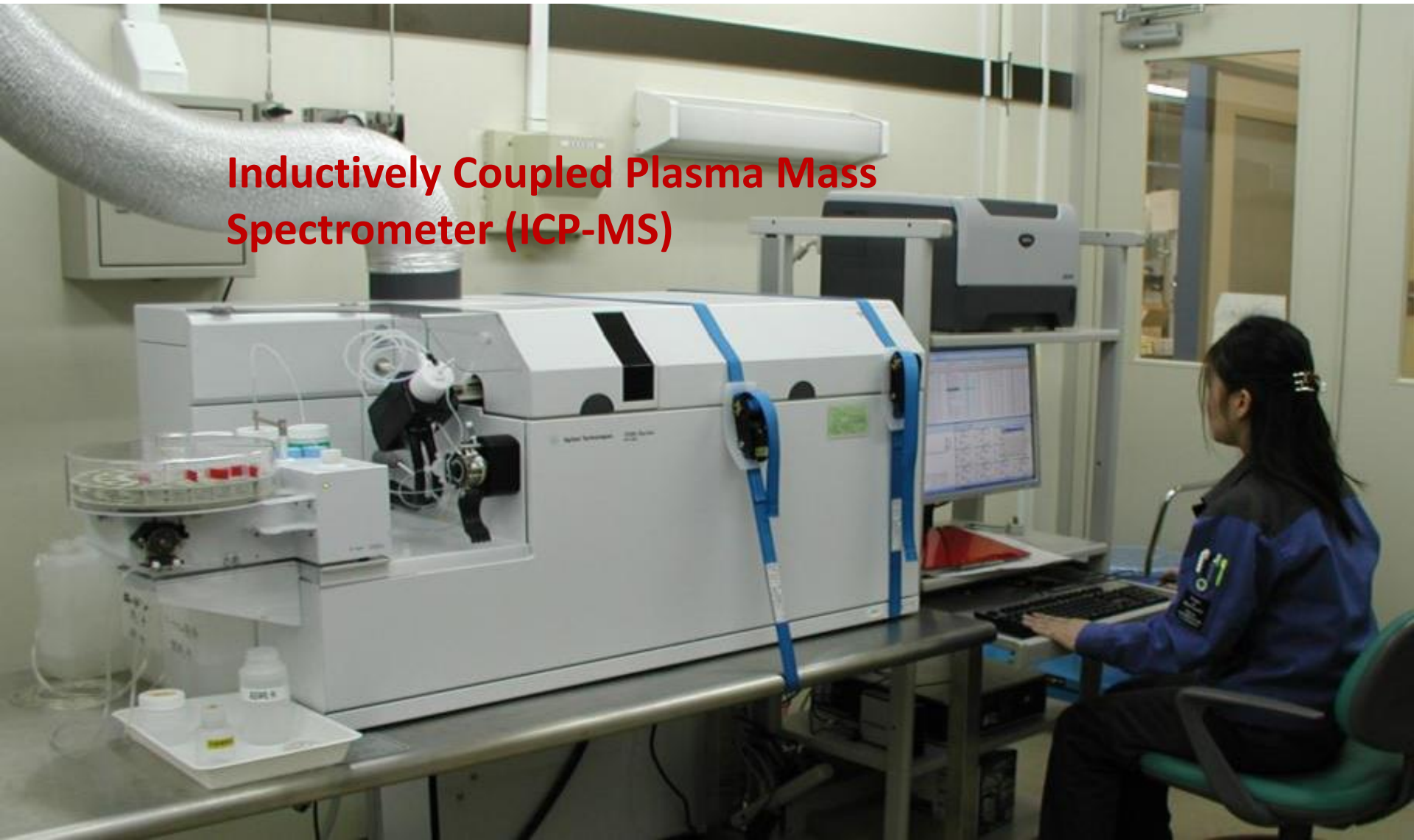
Object: odor substance;
disinfection by-product; pesticide

1. Surveying and Monitoring Water Sources



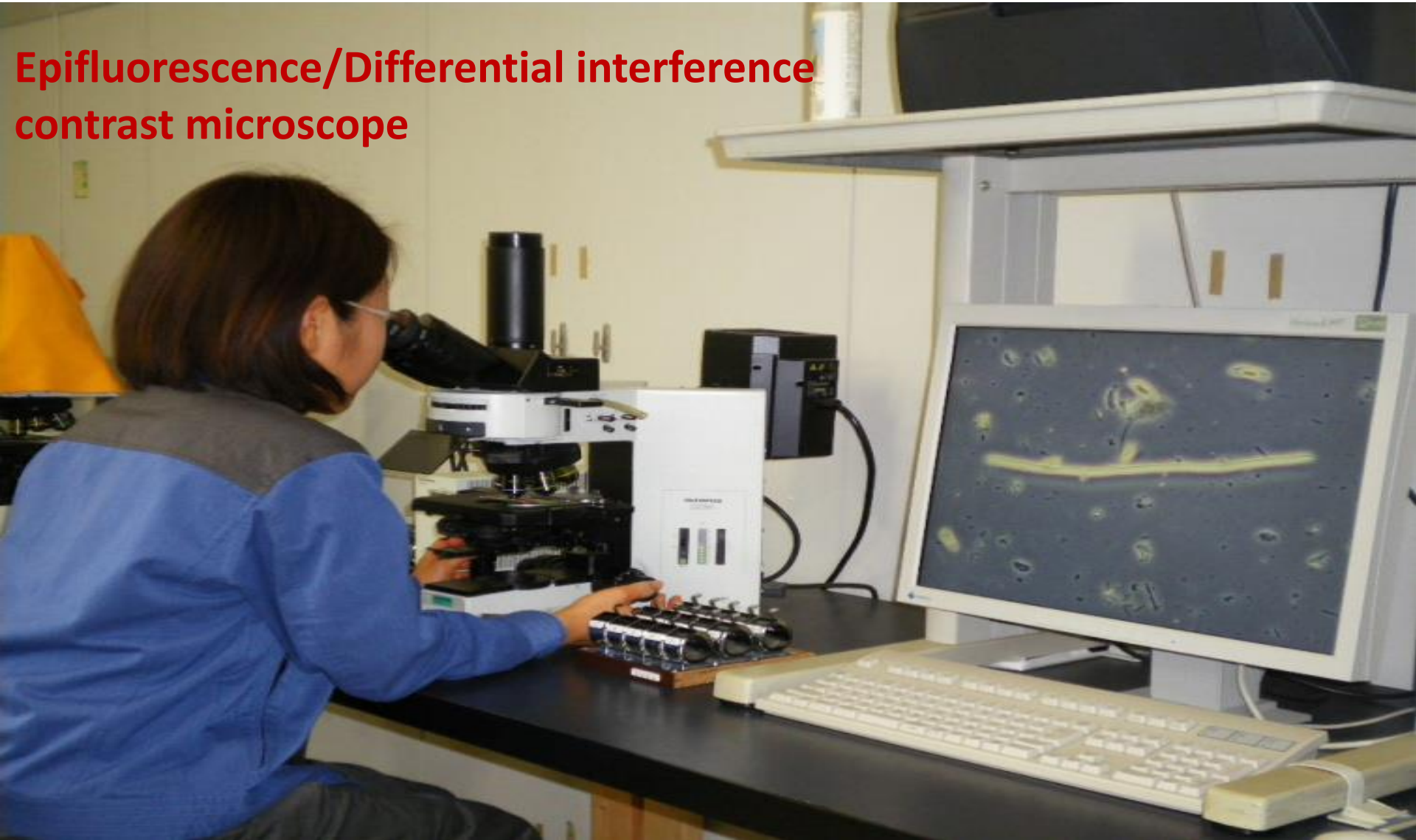
Analysis of metals such as Cadmium, Lead, Arsenic, etc

**Inductively Coupled Plasma Mass
Spectrometer (ICP-MS)**

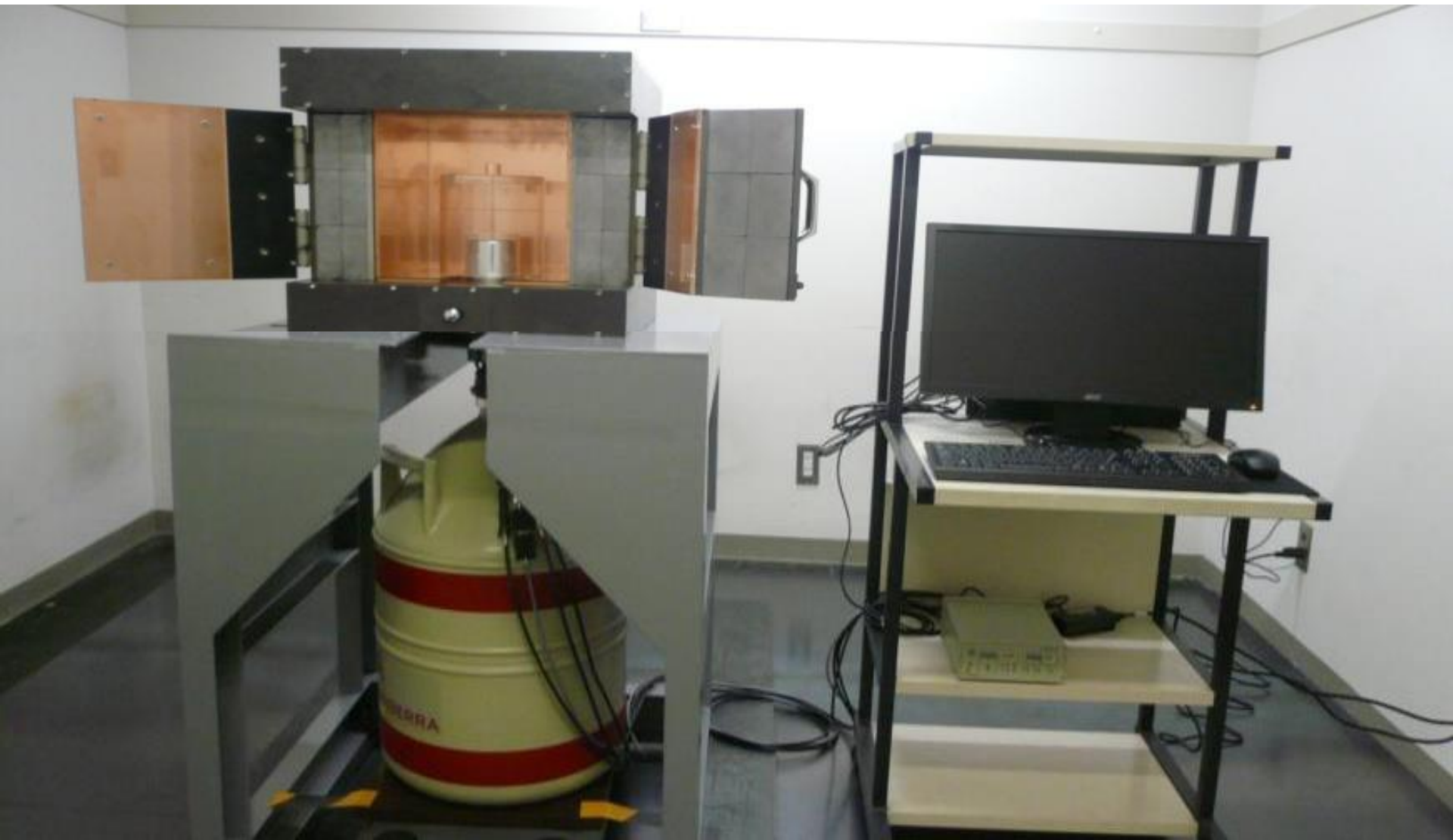


Test of pathogenic protozoa and filter-clogging microorganisms

Epifluorescence/Differential interference contrast microscope



Radioactive Material Measurements



Human resource of water quality division

③ Water quality consultation section **10 staffs**

- Water quality inspection requested by customer or other waterworks.
- Manage 62 automatic chlorine meters located at customer house.



Flow of Water Sampling at Customer's House



Excuse me.



Take sample.

Please read this sheet.

Give the sheet of water quality items.



Management of the Tap Water Quality



Dead fish that have washed up on the shore or Collecting oil with oil fences and mats



Emergency Vehicle
and Mobile Laboratory

Examination in the Mobile Laboratory



Investigation of new condition of membrane filtration





Power generator

1st generator



2nd generator



	Output	Voltage	Usual fuel	In case of emergency
1 st gas engine	1,400 kW	3.15 kV	Gas	LNG
2 nd gas engine	2,100 kW			

Improvement of the water quality in the reservoirs



Waterworks lessons for schoolchildren



Annual meeting of water quality management



Fuel Tank (LNG) for emergency



Photovoltaic generation on the top of filter basin covers



Capacity	Voltage	material	Number	Annual amount	Note
400 kW	AC 200 V	Silicone	2,688	300,000-400,000kWh	Panels are put on aluminum frame above filtration basin

Drinking Water Quality Standard of Japan (Rivised2014)

No.	Item	Standard value	No.	Item	Standard value
1	Standard plate count	100 cfu*/mL	27	Total trihalomethanes	0.1 mg/L or less
2	Escherichia coli	Not to be detected	28	Trichloroacetic acid	0.2 mg/L or less
3	Cadmium and its compounds	0.003 mg/L or less	29	Bromodichloromethane	0.03 mg/L or less
4	Mercury and its compounds	0.0005 mg/L or less	30	Bromoform	0.09 mg/L or less
5	Selenium and its compounds	0.01 mg/L or less	31	Formaldehyde	0.08 mg/L or less
6	Lead and its compounds	0.01 mg/L or less	32	Zinc and its compounds	1.0 mg/L or less
7	Arsenic and its compounds	0.01 mg/L or less	33	Aluminum and its compounds	0.2 mg/L or less
8	Hexavalent chromium	0.05 mg/L or less	34	Iron and its compounds	0.3 mg/L or less
9	Nitrite nitrogen	0.04mg/L or less	35	Copper and its compounds	1.0 mg/L or less
10	Cyanide and cyanogen chloride	0.01 mg/L or less	36	Sodium and its compounds	200 mg/L or less
11	Nitrate nitrogen and nitrite nitrogen	10 mg/L or less	37	Manganese and its compounds	0.05 mg/L or less
12	Fluoride and its compounds	0.8 mg/L or less	38	Chloride	200 mg/L or less
13	Boron and its compounds	1.0 mg/L or less	39	Calcium, magnesium etc. (hardness)	300 mg/L or less
14	Carbon tetrachloride	0.002 mg/L or less	40	Total dissolved substance	500 mg/L or less
15	1,4-dioxane	0.05 mg/L or less	41	Anionic surfactant	0.2 mg/L or less
16	Cis-1,2-dichloroethylene and trans-1,2-dichloroethylene	0.04 mg/L or less	42	Geosmin	0.00001 mg/L or less
17	Dichloromethane	0.02 mg/L or less	43	2-methylisoborneol	0.00001 mg/L or less
18	Tetrachloroethylene	0.01 mg/L or less	44	Non-ionic surfactant	0.02 mg/L or less
19	Trichloroethylene	0.03 mg/L or less	45	Phenols	0.005 mg/L or less
20	Benzene	0.01 mg/L or less	46	Organic matter(Total organic carbon)	3 mg/L or less
21	Chlorate	0.6mg/L or less	47	pH value	5.8 to 8.6
22	Chloroacetic acid	0.02 mg/L or less	48	Taste	Not to be abnormal
23	Chloroform	0.06 mg/L or less	49	Odor	Not to be abnormal
24	Dichloroacetic acid	0.04 mg/L or less	50	Color	5 degrees or less
25	Dibromochloromethane	0.1 mg/L or less	51	Turbidity	2 degrees or less
26	Bromate	0.01 mg/L or less	Note: cfu = colony forming unit		

Equipment for water analysis

Residual chlorine meter

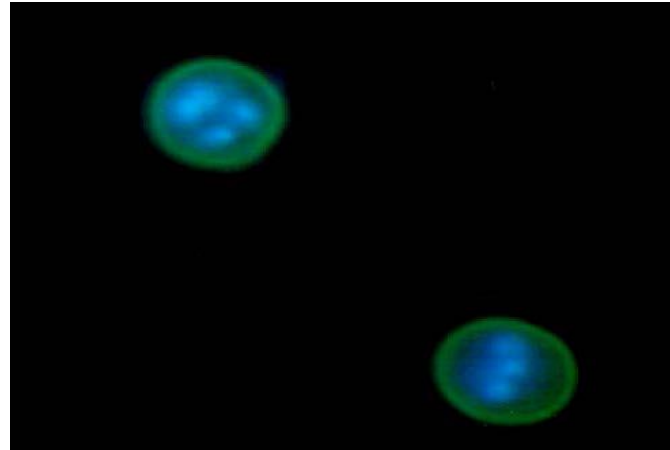


Turbidimeter



Water Source Pollution

Cryptosporidium



Phytoplankton



Chemical substances



Automatic Water Quality Monitoring System

ANIMATIONS

SLIDE SHOW

REVIEW

VIEW

- ماهی: از لحاظ بیولوژیکی ماهی جزو حیواناتی میباشد که عملکرد آن به مواد سمی دقیقا مشابه انسان میباشد. این بدان معنی است که اگر ماده سمی برای انسان خطرناک باشد برای ماهی نیز این ماده سمی خطرناک میباشد.

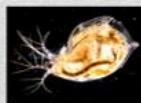
• دافنیا (Daphnids)

• آلگا (Algae)

• باکتریهای لومینسنت (luminescent Bacteria)

• صدف ها (Mussels)

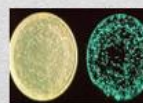
دافنیا



آلگا



باکتری



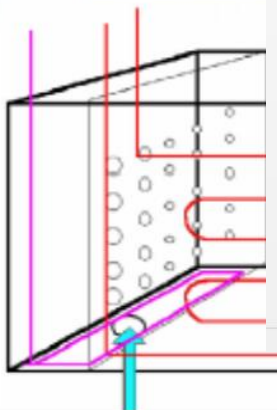
صدف



ماهی



ارگانيسمهای مورد استفاده در بیومانیتورینگ

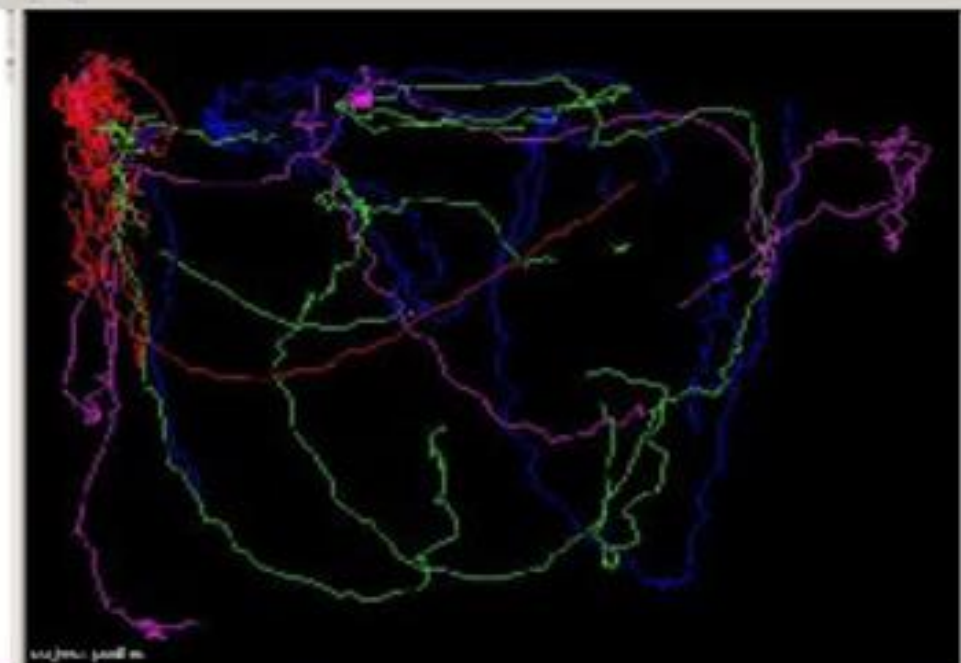






Measurement started! File=cf_data\rf_joc_joc_2009-03-26_1537.dpm

File Measurement Parameters Control Edit Windows ?



parameter	log	log
index	8.10	
exvel	0.1052 cm/s	
exheight	14.8644 cm	
exdet	18.6856 cm	
varvel	4	
speed det	0.3000	
var det	1.7687	
index bot	1.1567	
detection rate	61 %	
exp sample	1 ° 4 ° C	
Thursday 26.03.2009 17:07:00		
12 [max=15]		

OK

Resolution

Ogochi Dam and Reservoir



Photo-28 Measurement of Uplift pressure



Photo-29 Plumb line



Photo-30 Measurement of Leak



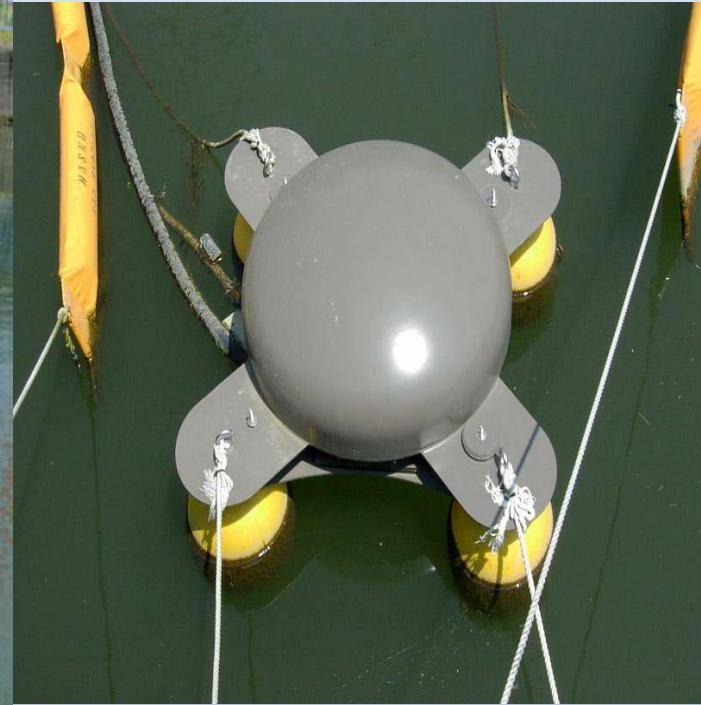
Photo-31 Seismometer



شناسایی آلودگی مشتقات نفتی



Surface oil detector



Information is transmitted to P.P. automatically

شستشوی شبکه توزیع

1. Purpose

- Recovery of pipeline condition
- Stability of pipe flow
- Remove the foreign object and dirt inside the pipeline
- Push Back a foreign object and dirt of the pipeline with pig and pressured water

2. Under the circumstance

- Flashing after the Piping Work
- Lining pipeline
- Situation Replacement of Pipeline
- Newly-laid pipeline and connecting pipeline
- Expansion Pipe and T-pipe, divided T-pipe, service pipe branching sub main
- Drain Pipe, Small Diameter Fire-Hydrant



3 Kinds of Methods

- Pig Method or Pig Pipe Cleaning method use the pig which made by Polyurethane
- Ice pig method use ice

روش های شستشوی شبکه

Inner Pipe Wall Condition

Solid Mass of Rust

Red Rust, Manganese, Biofilm

Hard Pig, Scraper

Soft Pig, Ice Pig



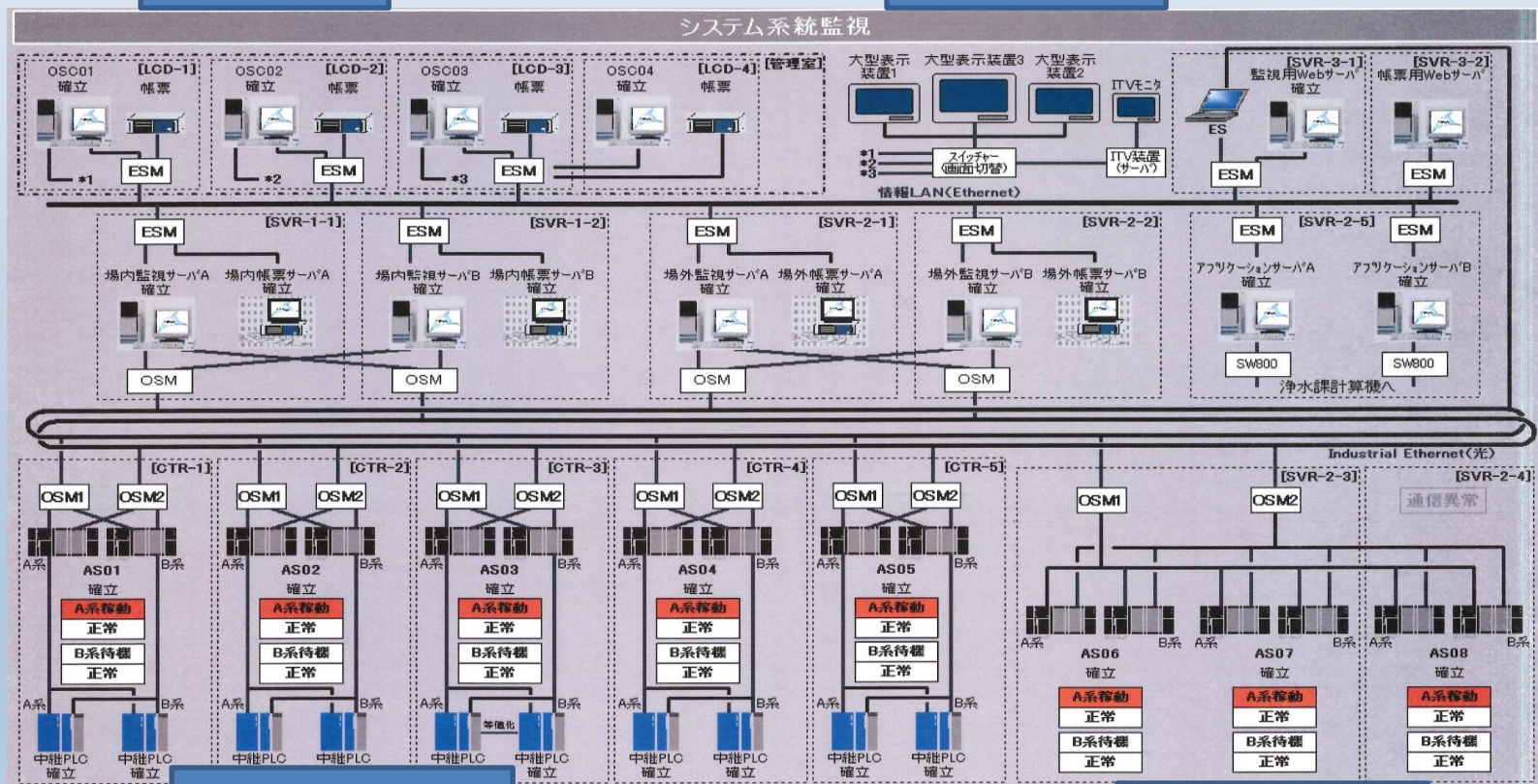
Operation and Control of Nishiya Purification Plant



کنترل واحدهای عملیاتی و فرآیندی

Operation
Board

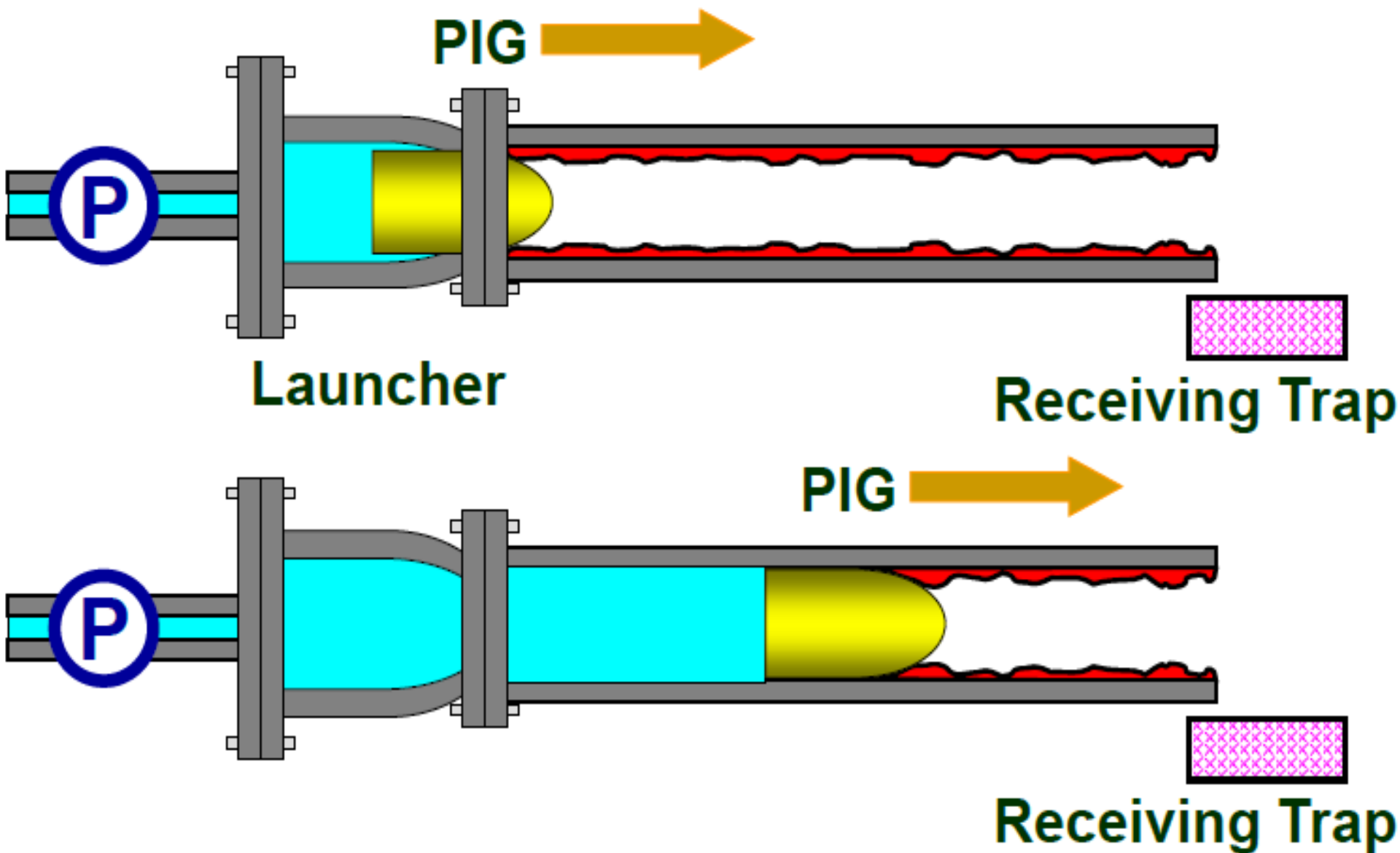
Monitoring
Camera



Controller for
Inside PP

Controller for
Outside PP

PIG Pipe Cleaning Method



Ice Pig Method

作業1: 製氷作業

特殊アイスシャーベット製造



作業2: 輸送作業

専用デリバリーユニット車で輸送



作業4: 管内注入作業

ポンプで管内注入



作業5: 管内洗浄作業

水流と水圧で押し流す



作業6: 回収作業

夾雑物の回収



作業3: 品質検査

含水率のチェック



洗浄効果実験

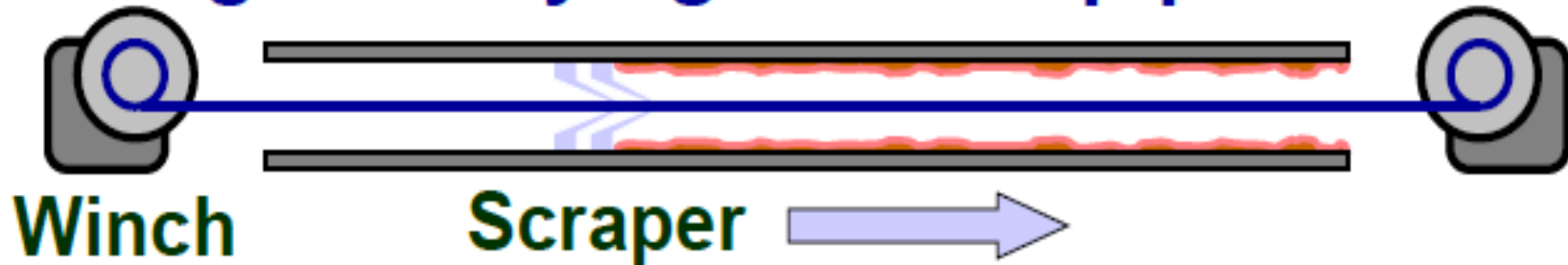
洗浄前・洗浄後の管内の比較

管内洗浄実験

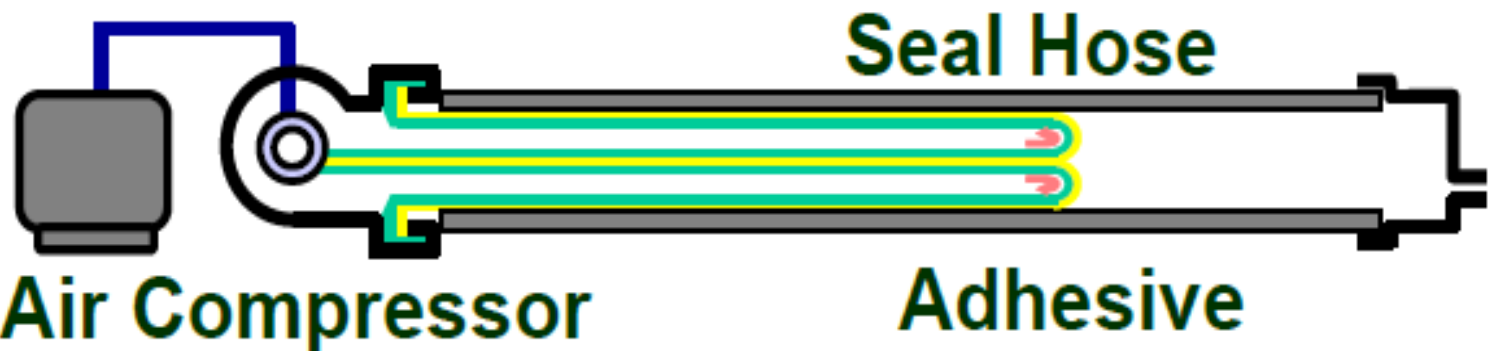
夾雑物の持ち上げ実験

Seal Hose Lining

1. Cleaning and drying of inner pipe wall



2. Turning over and glueing hose to pipe



3. Heating and cooling of the inner of pipe



**Thank you very much
for your attention**

