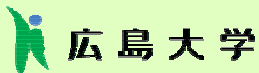


WEPA/ Vientiane, Lao PDR 2008.2.18

## JAPANESE EXPERIENCES ON THE MANAGEMENT OF WATER ENVIRONMENT



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### Water Quality Standards for Lakes and Reservoirs: T-N, T-P

Category	water use	Standards	
		T-N	T-P
I	Conservation of natural environment, and uses listed in II-V	0.1	0.005
II	Water supply classes -I, 2 and 3 (except for special types), fishery class 1, bathing; and uses listed in III-V	0.2	0.01
III	Water supply class-3 (special types), and uses listed in IV-V	0.4	0.03
IV	Fishery class 2, and uses listed in V	0.6	0.05
V	Fishery class 3, industrial water; agricultural water; conservation of living environment	1.0	0.1

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## ***Environmental Water Quality Standards***

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- The Basic Law for Environment
- Preferable conditions of aquatic environment
  - *To protect human health*
  - ***To conserve living environment***
    - All the properties closely related with:*
      - daily human life
      - the living environment for plants and animals closely related to human life
      - protect aquatic organisms closely related with daily human life



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## ***N/P Standards for Lakes Based on Expected Uses of Lake Waters***

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- Conservation of natural environment
- Drinking water supply: class 1, 2, 3
- Recreation/ bathing
- Fisheries: class 1, 2, 3
- Irrigation
- Industrial water supply
- Conservation of environment



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## Drinking Water Supply

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### Troubles in drinking water purification plants?

- *Water supply class 1* :  
slow sand filtration
- *Water supply class 2* :  
conventional coagulation / rapid sand filtration
- *Water supply class 3* :  
advanced treatment with pretreatment



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## Water supply class 2 : rapid sand filtration

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### Growth of phytoplankton

- increase in coagulant doses
- decrease in filtration time
- N and P in raw waters ?  
vs. problems in rapid sand filtration
- Little problems in rapid sand filtration if

$$T-P \leq 0.03 \text{ mg/l}, T-N \leq 0.4 \text{ mg/l}$$



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## ***N and P vs. troubles in rapid sand filtration***

$T-P \leq 0.03 \text{ mg/l}$ ,  $T-N \leq 0.4 \text{ mg/l}$ ?

plants	lakes	T-N (mg/l)	lakes	T-P (mg/l)
with troubles	L. Kasumigaura	1.21	L. Kasumigaura	0.10-0.24
	Tonden R.	0.76-1.57	L. Sagami	0.2*
	Hata R.	0.40-0.66	-	-
w/o troubles	-	-	Yamaguchi R.	0.03-0.07



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\*estimated from inorganic N and P concentrations

## ***Musty Odors***

● by *actinomyces*, cyanobacteria

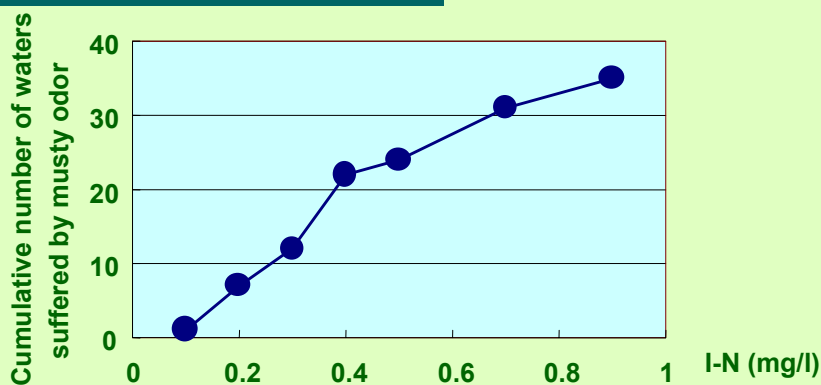
Frequent musty odor by the report in Japan Water Works Association:

- inorganic nitrogen  $\geq 0.3 \text{ mg/l}$
- ortho-phosphate  $\geq 0.006 \text{ mg/l}$
- $\cong T-P 0.009 \text{ mg/l}$



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## Musty odor lakes vs. inorganic nitrogen



● I-N  $\geq 0.1$  mg/l  $\doteq$  0.15 mg T-N/l  $\rightarrow\rightarrow\rightarrow$  musty odor

● prevent musty odors : T-P  $\leq 0.01$  mg/l, T-N  $\leq 0.2$  mg/l



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## Water supply class 2 : rapid sand filtration

● filtration :

T-P  $\leq 0.03$  mg/l, T-N  $\leq 0.4$  mg/l

● musty odors :

T-P  $\leq 0.01$  mg/l, T-N  $\leq 0.2$  mg/l?



T-P  $\leq 0.01$  mg/l, T-N  $\leq 0.2$  mg/l



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## ***EFFLUENT STANDARD FOR N,P***

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- **National Minimum Standard**

- T-N: 120 mg/l (daily max.), 60 mg/l (daily ave.)
- T-P: 16 mg/l (daily max.), 8 mg/l (daily ave.)
- daily discharge > 50 m<sup>3</sup>
- closed waters with high possibility of eutrophication

- **Provisional Standard ← best available technology**

- specified industries: N:55, P:39
- national minimum in 5 years (1993-1998)



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## ***PROVISIONAL STANDARD***

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- **Industries hard to comply with the national minimum standard**
  - pig/cattle farm: N (700,350), P (100,50)
  - coke oven: N (170,130)
  - dairy products, tofu: P (30,15)
- Improvement in production process
- Input-output analysis for N,P,C



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## PROVISIONAL STANDARDS FOR FOOD INDUSTRIES

	code	T-N		T-P	
		max.	ave.	max.	ave.
meat processing	1211	140	70	140	70
dairy products	1212	-	-	30	15
other livestock products	1219	140	70	60	30
fish canning, bottling	1221	440	220	100	50
seaweed processing	1222	180	90	60	30
fish ham/sausage	1224	260	130	160	80
fish paste (boiled)	1225	460	230	320	160
frozen fish products	1226	360	180	140	70
frozen fish processing	1227	460	230	320	160
other fish products	1229	380	190	340	170
soy source and amino acds	1242	480	240	-	-
synthetic seasoning	1243	480	240	-	-
beet sugar refinery	1251	260	130	50	25
fresh cake	1272	-	-	60	30
vegetable oil	1281	-	-	100	50
animal oil	1282	180	90	100	50
grain starch	1292	-	-	30	10
potato starch production	1292	500	250	140	70
tufu/tofu derivatives	1295	-	-	30	15
bean jam	1296	-	-	60	30



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## REVISION OF THE PROVISIONAL STANDARDS

- PROVISIONAL STANDARDS:
  - 1993.10-1998.9
- REVISION: 1998.10-2003.9
  - N: 50 INDUSTRIES → 4 INDUSTRIES  
2,851 plants → 115 plants
  - P: 34 INDUSTRIES → 3 INDUSTRIES  
2,512 plants → 117 plants
- REVISION: 2004.10-2009.9



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## ***Revised Standards: P***

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- **Alumite Processing : 1,000 (530) → 50 (25)**  
*Only for chemical polishing processes by phosphoric acid*
- **Feedlot : 100 (50) → 50 (40)**
- **Phosphorus and Compounds :**  
**640 (280) → 90 (40)**



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## ***Revised Standards : N***

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- **Natural Gas : 200 (180) → 170 (150)**
- **Feedlot : 270 (350) → 260 (200)**
- **Inorganic Chemical Industries**
  - **Silver Oxide : 560 (370) → 350 (300)**
  - **Yttrium Oxide : 35,000 (12,000) → 3,500 (1,200)**
  - **Vanadium & Molybdenum Compounds :**  
**26,000 (17,000) → 8,000 (6,000)**



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## **2<sup>nd</sup> REVISION (2003.10-) OF THE PROVISIONAL STANDARDS**

### ●N: 5 INDUSTRIES

- Natural Gas : 200 (180) → 170 (150) → 160 (150)
- Feedlot : 270 (350) → 260 (200) → 190 (150)
- Silver Oxide : 560 (370) → 350 (300) → 240 (210)
- Lead Chromate Paint : 1,300 (950)
- Vanadium & Molybdenum Compounds :  
26,000 (17,000) → 8,000 (6,000) → 6,000 (5,000)

### ●P: 2 INDUSTRIES

- Feedlot : 100 (50) → 50 (40) → 30 (24)
- Phosphorus and Compounds : 640 (280) → 90 (40) → 40 (10)



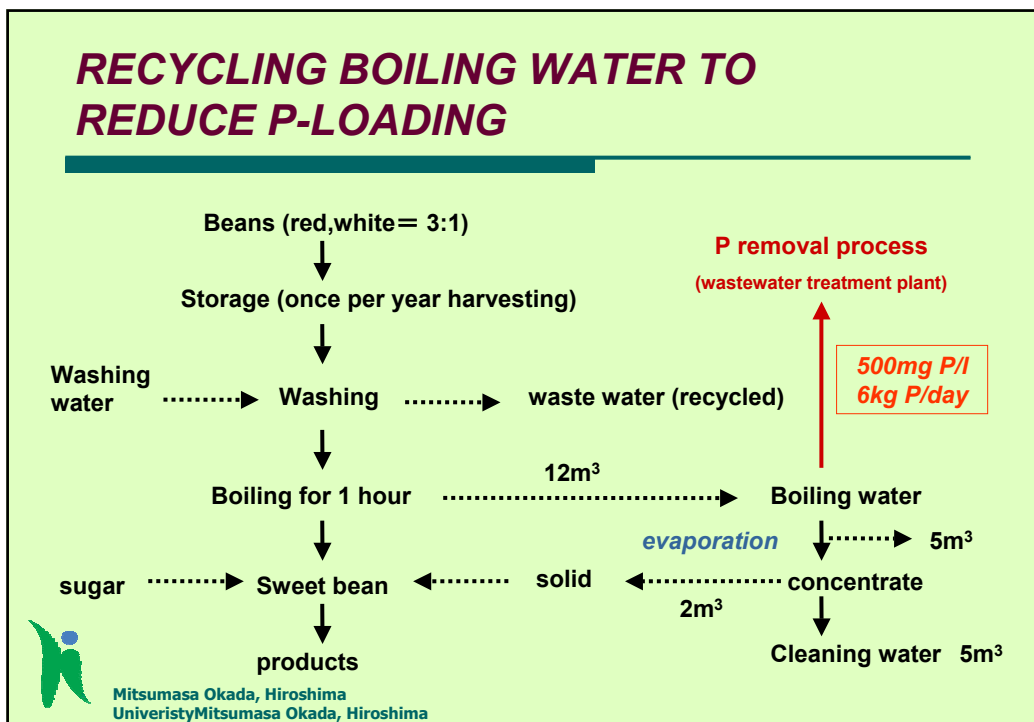
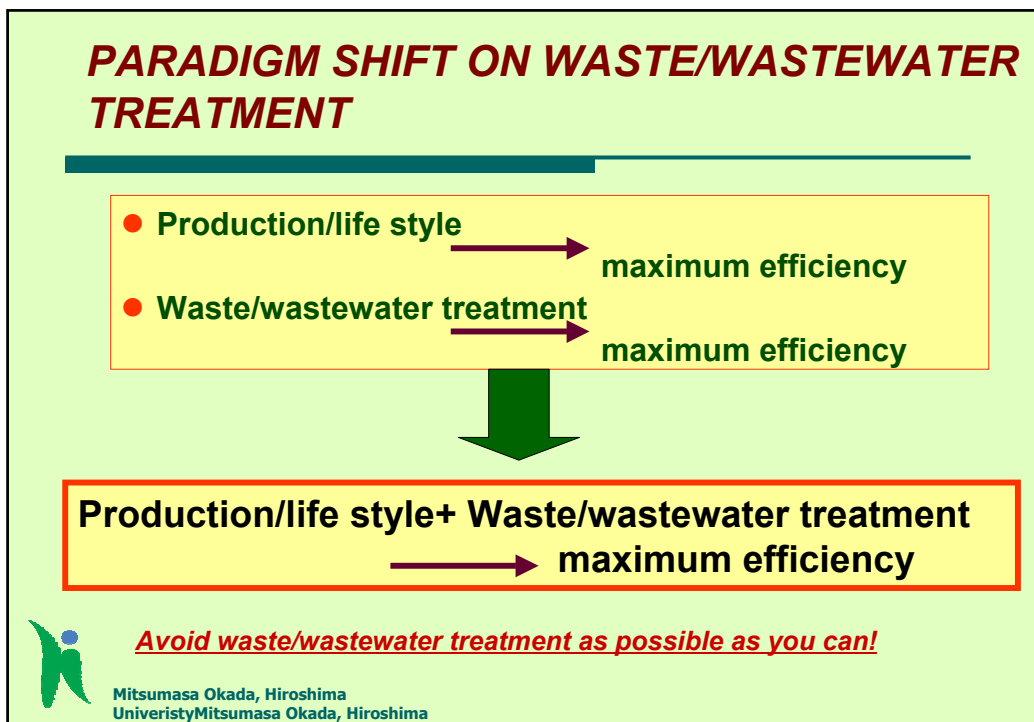
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## **Effluent Guideline for N and P in Tokyo Bay**

	daily discharge (m <sup>3</sup> )	new		operating				
		N	P	N		P		
				(1)	(2)	(1)	(2)	
industries	food	50-400	15	1.5	15	20	3.0	4.0
		>400	10	1.0	10	15	2.0	3.0
	chemical	50-400	10	1.0	10	20	1.0	2.0
		>400	8	0.5	10	15	1.0	2.0
	steel	50-400	10	1.0	10	15	1.0	3.0
		>400	8	0.5	8	10	0.5	2.0
	metal	50-400	15	1.0	20	25	2.0	3.0
		>400	10	0.5	10	15	0.5	1.0
	others	50-400	10	1.0	10	25	1.0	3.0
		>400	8	0.5	10	20	1.0	2.0
others	livestock	50-400	40	5.0	40	50	5.0	8.0
		>400	30	3.0	30	50	3.0	8.0
	P.O.W.T.P.	>50	10	0.5	15	20	1.0	2.0
	night soil T.P.	>50	10	1.0	20	45	2.0	3.0
	Jokaso	>50	20	3.0	20	30	4.0	5.0
	others	>50	20	3.0	20	25	3.0	5.0



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## SUMMARY

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### ① Environmental water quality standards

- *All the standards were developed based on limited scientific understandings and information to secure water use*

### ② Effluent water quality standards

- *The standards are proposed to satisfy with the environmental water quality standards but never ignored the state of the (best) available technology*

### ③ Reduction of wastewater loading

- *Green Engineering: The better production technology to reduce wastewater loadings rather than wastewater treatment*



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