Purification Methods and Engineering Consultants

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NAKANIHON ENGINEERING CONSULTANTS

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NAKANIHON
Engineering Consultants co.,ltd

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What is NAKANIHON?

- Engineering consultant company
- Head office in Nagoya city
- Number of employee : 310
- Office : 35

What do we do?

NAKANIHON Engineering Consultant's
Engineering Department

Environment & Water Works Dept.	River & Sewerage Works Dept.	Transportation & Urban Design Dept.
• Environmental Investigation and assessment • Water Works	• River • Sewerage Works	• Road • Railways • Bridge

Purification Methods

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Where is Japan

○

世界地図

Apx.6,860km

Japan

Sri Lanka

2012/11/15
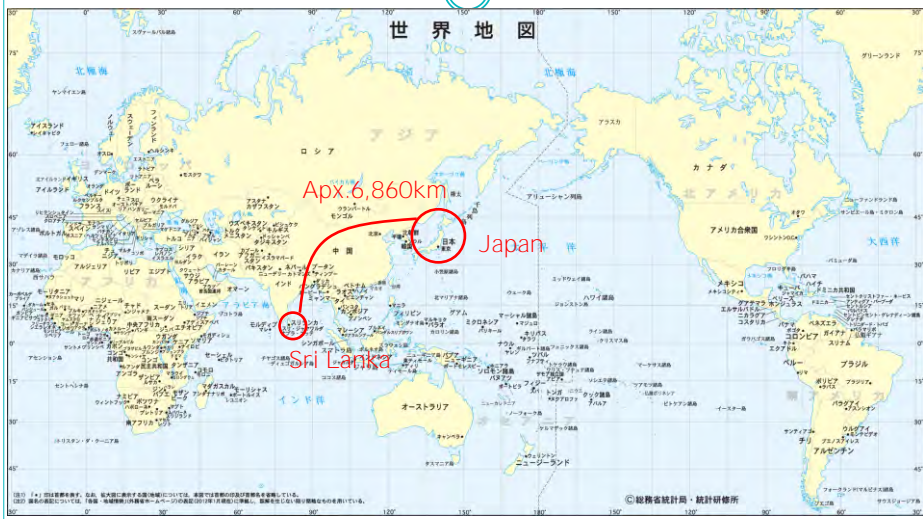
What is hot in Japan Water Works?

History of water work

(less amount)   (sand filtration system)

| BC312 | 1183 | 1235 | 1590 | 1804 |

Apia Canal (Rome)   Belle Ville (Paris)   Tyburn (London)   Edo (Japan)   Paisley Water (British)

Water Work in Japan

Ultra Violet Beam(Anti Cryptosporidium)

Membrane Filtration

1987

| 1887 | 1955 | 1965 | 1975 | 1985 | 1995 | now |

32.2% 69.4% 87.6% 93.3% 95.8% (Coverage ratio) 97.5%
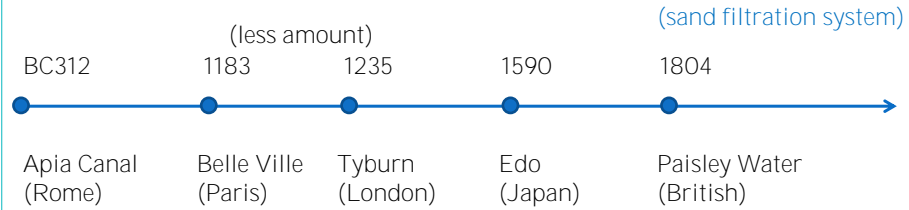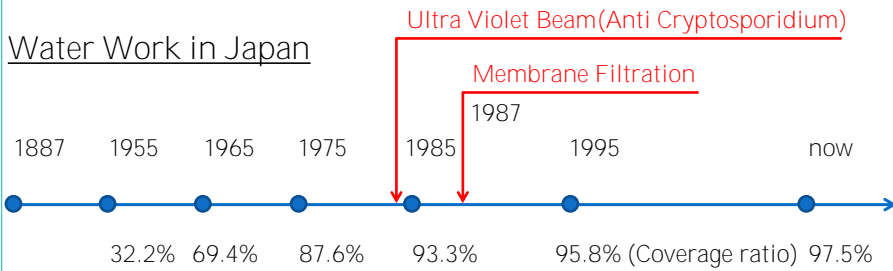
Tap Water Coverage Ratio in the World

Coverage Ratio(WHO 2006)

Japan	S.Korea	China	Hongkong	Cambodia	Thai	India	SriLanka	Nepal	N.W.Africa	E.S.Africa	EU	N.C.America	S.America	Oceania	World.Avg
96	92	75	100	30	84	84	77	88	72	55	94	95	87	88	81
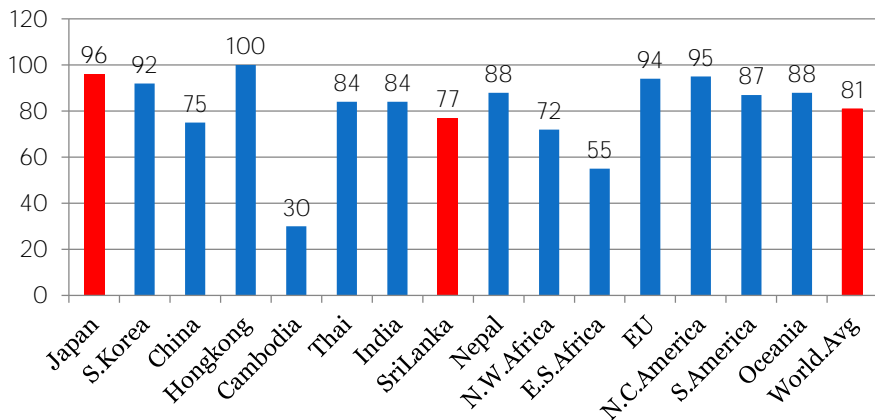
But only Tap Water in 11-13 countries are drinkable   (WHO Standard)

Purification Method

Antisepsis
- Chlorination
- UV Irradiation *new*

Filtration
- Slow Sand Filtration
- Rapid Sand Filtration
- Membrane Filtration *new*

Special Treatment
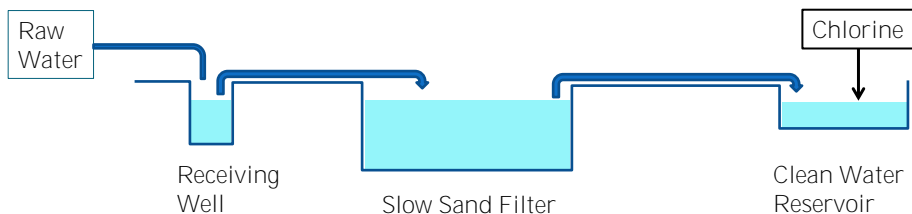- pH Adjustment
- Iron
- Manganese
- Odor
- Color
- Fluorine
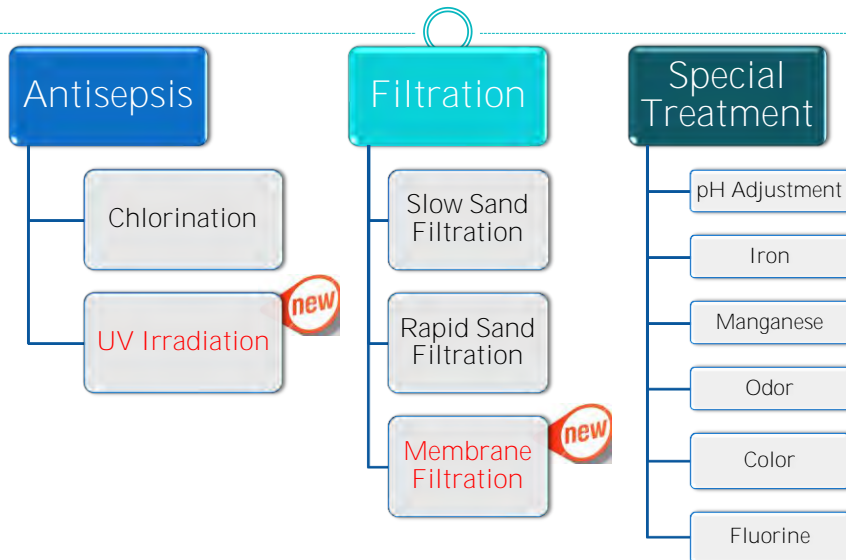
Slow Sand Filtration

- Turbidity <10 deg.
- Velocity=4 – 5 m/day
- No Chemical
- O&M : easy

Photo: Slow Sand Filter

Raw Water
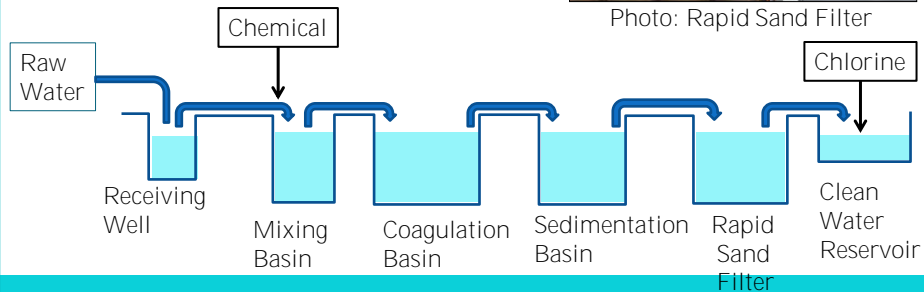
Chlorine

Receiving Well

Slow Sand Filter

Clean Water Reservoir

Rapid Sand Filtration

- Turbidity <10 deg.
- Velocity=120– 150 m/day
- Use Chemical
- O&M: difficult

Photo: Rapid Sand Filter

Chemical

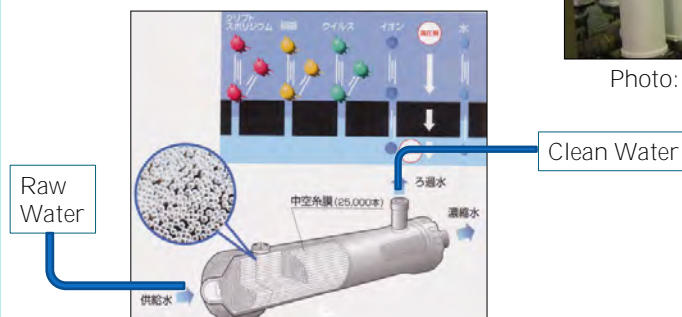Chlorine

Raw Water

Receiving Well

Mixing Basin

Coagulation Basin

Sedimentation Basin

Rapid Sand Filter

Clean Water Reservoir

Membrane Filtration

- Turbidity : any level
- No Chemical
- O&M: easy

Photo: Membrane Units

Clean Water

Raw Water

6

Engineering Consultants

Role of Engineering Consultants in Water Works
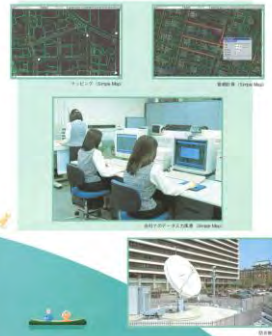
PLANING

Ideal work for next Generation

DESIGNING

Smart, Economic, Strong, Easy to use

MANAGEMENT

Understand everything about your own asset

Master Plan
Vision etc.

Water work facility
Pipe Network etc.

Pipe Network System(Simple Map)
Community Wireless System

Intake Facility (290,000m3/d)

Intake Facility (34,900m3/d)

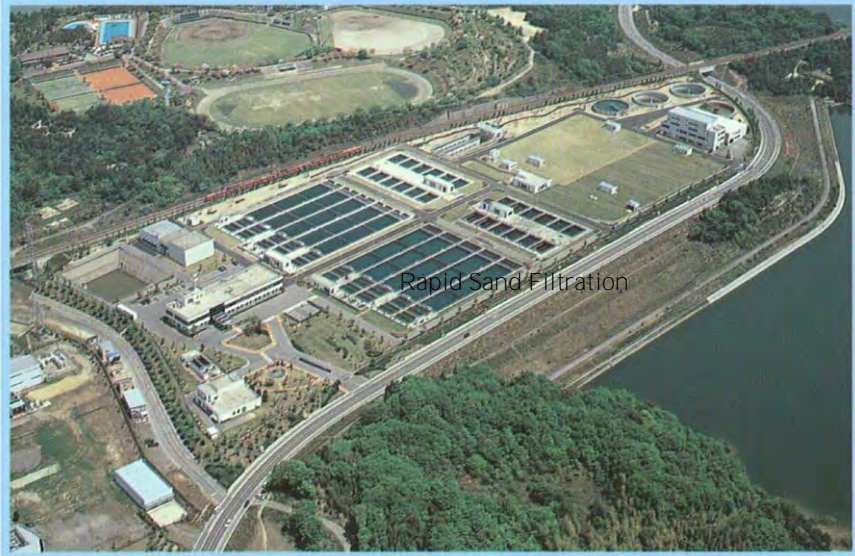## Purification Facility (500m3/d)

Slow Sand Filtration

Purification Facility (3,590m3/d)

UV　Unit

UV　Lamp
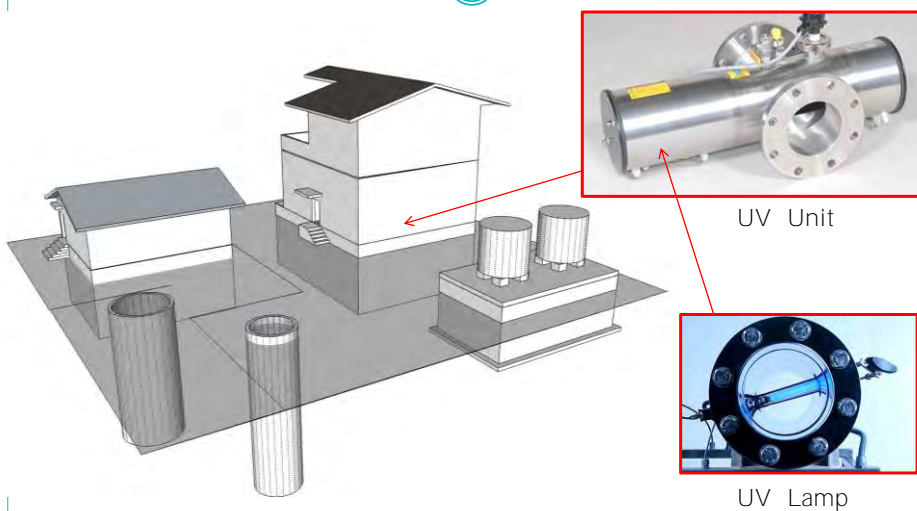
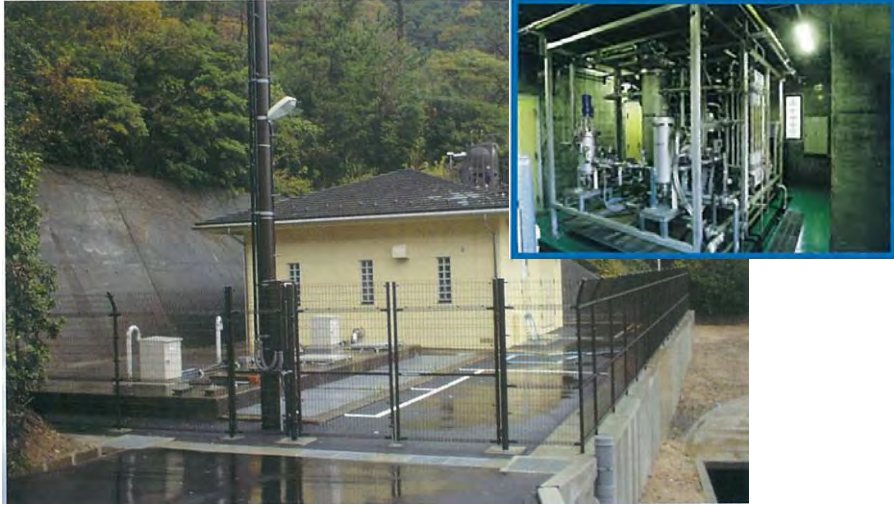## Purification Facility (296,000m3/d)

Rapid Sand Filtration

Purification Facility (100m3/d)

Membrane Filtration

Purification Facility (100m3/d)

Membrane Filtration

Transmission Facility (24,000m3/d)
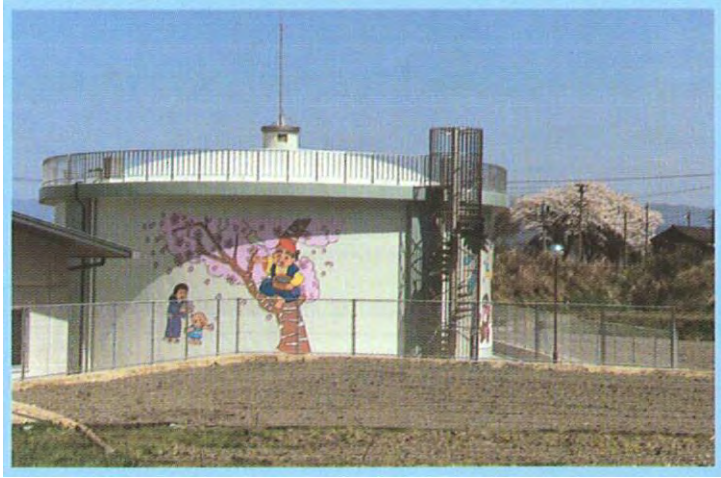
Distribution Facility

PC tank :4,000m3

Distribution Facility

PC tank :15,000m3   PC tank :10,000m3

Distribution Facility

PC tank :1,500m3

Management System(Simple Map)

Community Wireless System

NEW TECHNOLGY FOR S U R V E Y OF LEAKAGE DETECTION

September 2012

TESCO CO.,LTD

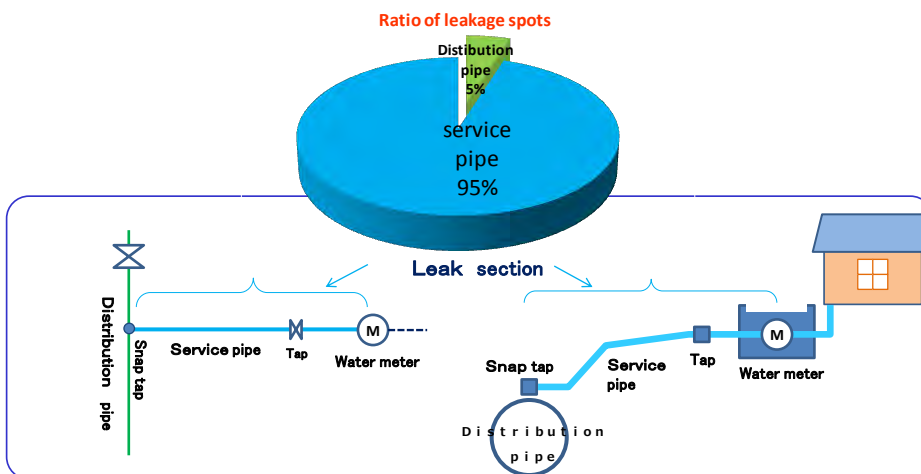## 1 Most leakages are caused in service pipes

● *95% of leakages* were taken place between snap tap and water meter

Ratio of leakage spots

Distibution pipe 5%

service pipe 95%

Leak section

Distribution pipe

Snap tap

Service pipe Tap Water meter

Snap tap Service pipe Tap Water meter

D i s t r i b u t i o n   p i p e

2 Screening Method for Detection

● Service pipes with leakage are screened by detector and the leak checker

- Only **6%** of service pipes are surveyed by experts

- **94%** of service pipes are normal

Leakage | noise | Leakage | Normal use water

Leak checker

Small amount of leakage
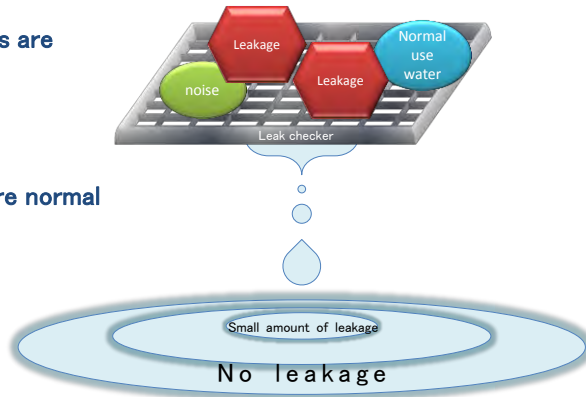
No leakage

3 Leakage detection instrument (Leak Checker)

■ **Features**

Light and small

Great reduction of detection time

Applicable to non metal pipes (e.g. PVC etc.)

It is possible to go to work, reading meter and detection of leakage of the same time

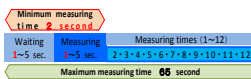Data storage by wireless data transmission

■ **Specifications**

TS Leak checker	
Type No.	SV1108A
Components	Built-in-sensor
Weight	330g or so（Battery included）
Battery	AA 1.5V×2 （Hours operation : 2 weeks）
Capacity	2,000 data
Data transmission （Wire less）	①Bluetooth V1.2 ②Infrared rays IrDA
Measurement time	Minimum 2 second
High pass filter	[HPF] L150Hz/H300Hz

■ **Handling**

Turn on start button after that put Leak checker on water meter

Measuring is repeated automatically when data over out at setting point（Repeat times with in 12）

Minimum measuring time **2 second**		
Waiting 1~5 sec.	Measuring 1~5 sec	Measuring times (1~12) 2・3・4・5・6・7・8・9・10・11・12
Maximum measuring time **65 second**		

Electron sound and LED inform as start and off

・Measuring results are indicated on display
・Data take down included memory

4 Principle of leak checker

> ● Utilize a characteristics of continued noise of leak and temporary noise

$$\text{Time Integration Rate}\ F = \frac{\displaystyle\sum_{i=1}^{n} t_i}{T} \times 100 \ (\%)$$
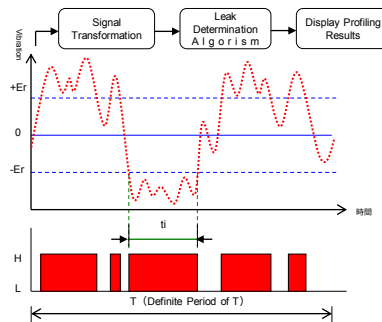
Mechanism

Water leak → Leak noise → Vibration through the pipe → catch the vibration by this instrument → calculate and analyze

Time Integration Rate

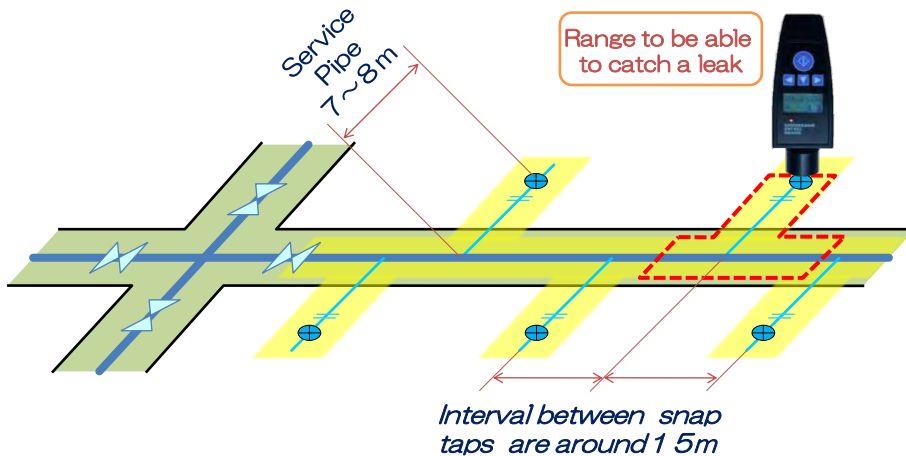Rate of signals within specified time

Criterion

Judged by time integration rate

5 Captured Range

> ● Possible range to catch leak noise is 20m on average
>
> ● It is possible to catch leak on the distribution pipe around densely populated area

Service Pipe 7～8m

Range to be able to catch a leak

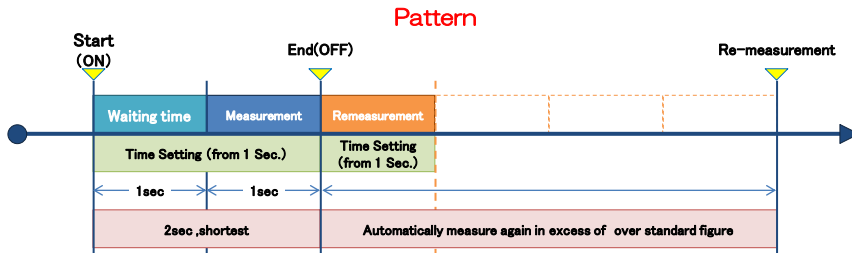Interval between snap taps are around 15m

6   How to use Leak Checker ?

● Push the button and it judges instantly

Install the measurement
condition from PC to LC

Put LC directly on water meter
and push the button

Pattern

Start (ON)	End(OFF)	Re-measurement

Waiting time	Measurement	Remeasurement

Time Setting (from 1 Sec.)   Time Setting (from 1 Sec.)

1sec   1sec

2sec ,shortest   Automatically measure again in excess of over standard figure

7   Inspection Result

Before inspection result

number	name	address	year	month	day	time	minute	second	date by integrated
00000001			2009	12	1	9	1	25	7
00000002			2009	12	1	9	3	30	10
00000003			2009	12	1	9	5	37	5
00000004			2009	12	1	9	8	43	34
00000005			2009	12	1	9	10	50	24
00000006			2009	12	1	9	12	0	2
00000007			2009	12	1	9	14	2	3
00000008			2009	12	1	9	16	9	7
00000009			**2009**	**12**	**1**	**9**	**18**	**15**	**82**
00000010			2009	12	1	9	20	25	9
00000011			2009	12	1	9	21	31	4
00000012			2009	12	1	9	23	42	3
00000013			**2009**	**12**	**1**	**9**	**25**	**49**	**61**
00000014			2009	12	1	9	27	56	5
00000015			2009	12	1	9	29	4	4
00000016			2009	12	1	9	30	10	1
00000017			**2009**	**12**	**1**	**9**	**32**	**17**	**99**
00000018			2009	12	1	9	34	27	3
00000019			2009	12	1	9	35	32	4
00000020			2009	12	1	9	37	39	4

This time inspection result

number	name	address	year	month	day	time	minute	second	date by integrated
00000001			2010	2	1	9	5	22	6
00000002			**2010**	**2**	**1**	**9**	**6**	**21**	**47**
00000003			2010	2	1	9	7	18	14
00000004			2010	2	1	9	9	30	4
00000005			2010	2	1	9	11	55	11
00000006			2010	2	1	9	15	27	2
00000007			2010	2	1	9	15	33	2
00000008			2010	2	1	9	17	45	10
00000009			2010	2	1	9	17	52	7
00000010			2010	2	1	9	19	26	10
00000011			**2010**	**2**	**1**	**9**	**22**	**43**	**43**
00000012			**2010**	**2**	**1**	**9**	**22**	**55**	**33**
00000013			2010	2	1	9	23	28	0
00000014			2010	2	1	9	23	34	1
00000015			2010	2	1	9	26	51	1
00000016			2010	2	1	9	26	57	0
00000017			2010	2	1	9	27	6	0
00000018			2010	2	1	9	27	9	1
00000019			2010	2	1	9	28	4	4
00000020			2010	2	1	9	28	10	1

Questionable place   Nothing leaking

On the case of keeping earlier data, it is possible to compare
the last time data and new data. The number spot is where new
data came up and can be judged as questionable place of leaking

8　Result of survey（A city in Japan）

- 6% of questionable places of leakage are selected by screening method
- 80% of leaking spots, 90% of leakage staunch were detected by second survey of questionable places

Number of screening 16,094			
Questionable places (Integrated %　99～60%)		Number of no leakage pipes （Integrated %　59～0%)	
988(6%)		15,106	
Noise	Leakage spots 122		Normally service pipes
889	99	23	15,083
	Leakage staunch 32.4(m³/h)		
	29.8	2.6	

9 Improve of leakage (Bangkok Thailand)

TESCO CO.,LTD has carried out the target of pilot project in official requisition

Objection of this project
　Reduce non revenue water rate of Phayathai area and to collect survey data to increase improving non-revenue water rate throughout Bangkok city
Term　　May 23 ～　Ｊ ｕ ｌ ｙ 14 , 2011
Client　　Metropolitan Waterworks Authority Thailand

Outline of Phayathai Branch Office Area

Item	Unit	Volume
Annual distribution total	m³	122,000,000
Annual revenue water	m³	87,452,000
Annual non revenue water	%	28.32
Extension of service pipe	km	1,126
Service area	km²	55.4
Number of customer	Number	84,506

Survey using leak checker

Water Leak on a Steel Pipe100mm

Second Survey (Pinpoint)

Improvement of non revenue water rate
in Phayathai area

Result of survey

Distance of survey(km)	10.4
Leakage place(number)	21
Leakage stanched (㎥/hr)	22.2
Number of leakage places(No./km)	2.019
Leakage staunch(㎥/hr/km)	2.135

Cause of pipe accident

Pipe crack	10
Tee pipe crack	1
Joint crack	1
Pipe joint	3
Collar joint	1
Gimbal joint	1
Fire hydrant packing	2
Valve packing	1
Damaged perforation	1
Total	21

Non revenue water rate

28.3%
(May 11) ⟹ 7.1%
(July 14)

10　Advantages of screening method

1. **Efficient work**	● **Reading of meter and check of the leakage are possible at the same time** ● **It is not necessary to move for survey** ● **Data result are recorded instantly**

2. **Early detection**	● **Shorten survey interval** ● **Reduce the recurrence of leakage** ● **Reduce accidents by leakage**

3. **Saving expense**	● **Much more can be surveyed with the same expenses** ● **Reduce compensation cost for accidents by leakage**

Thank you for your kind attention

コップなごや水基金

名古屋の水はおいしい!

木曽川支流

木曽川

名古屋