Initiatives for Water Recycling in Yokohama City
1. About Us: Yokohama City

2. Water Recycling
1. About Us: Yokohama City

2. Water Recycling
1. About Us: Yokohama City

Tokyo International Airport (Haneda) 30 min

Rose Flower of the City
1. About Us: Yokohama City

Nissan Stadium

Pacifico Yokohama

[Upcoming Events]
* Rugby World Cup 2019
* Tokyo Olympic 2020 Soccer Game

[Latest Event]
* 50th ADB Annual Meeting 2017

MICE
Meeting
Incentive Travel
Convention
Event / Exhibition
### Sewage Works

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>3.7 million</td>
</tr>
<tr>
<td>Service Rate</td>
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</tr>
<tr>
<td>Treatment District</td>
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<td>Wastewater Treatment Plant</td>
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</tr>
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<td>Pumping Station</td>
<td>26</td>
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<tr>
<td>Total Length of Sewer</td>
<td>11,800 km</td>
</tr>
<tr>
<td>Manhole</td>
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</tr>
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<td>Total Assets</td>
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Contents

1. About Us: Yokohama City

2. Water Recycling
2. Water Recycling

Effective Use of Wastewater/Sewage Sludge

Wastewater treatment

Reclaimed water

Local streams
Toilet flushing
Heat source

Fuel for gas generation
Supplementary fuel
Material for improved soil
Material for construction
Alternative fuel
Heat source

Digestion gas
Incinerated ash
Solid Fuel
Exhaust Gas

Sludge treatment

Material for improved soil
Material for construction
Alternative fuel
Heat source
2. Water Recycling

Filtered water:
Reclaimed water which is filtered with sand and disinfected with chlorine.

Main use:
Washing construction sites, cleaning roads, etc.
2. Water Recycling

Ozonated water:
Reclaimed water which is filtered with sand and treated with ozone oxidation.

Main use:
Toilet flushing, local stream, heat source for air conditioner, etc.
2. Water Recycling

- Ozone generator
- Sand filter
- Ozone reaction tank
2. Water Recycling

Flow of reuse treated water

- Water tank
- Advanced treatment process
- Reverse washing
- Ozonization device
- Ozone reaction tank
- Sodium hypochlorite
- Treatment of exhaust ozone gas
- Use for Kohoku WTP

Inter national Stadium Yokohama
2. Water Recycling

- **Blower**
- **cooler and dryer**
- **cooler**
- **water**
- **Ozone generator**
- **Ozone detector**
- **Ozonized air**
- **Density of ozone gas measuring device**
- **Ozone reaction tank**
- **Power**

- transformer
- controller
- Inverter
2. Water Recycling

Alternative high voltage discharge

structure

principle

Electrode
Glass
Discharge

Air

O3

Electrode

O2

O3

Ozone (O3)

Alternative high voltage discharge
2. Water Recycling

- Transformer
- Air
- Water
- O3
- Stainless tube
- Electrode (Glass tube with aluminum film)
- Brush
- Electrode (Glass tube with aluminum film)
- Electrode (stainless tube)
- Alternative high voltage
- air
- water
- discharge
- オゾン
2. Water Recycling

**Fare-paying services**
- Supplying to commercial facilities, municipal facilities (except sewage works)
- Selling via reclaimed water supplying device

**Free-of-charge services**
- Cooling and washing equipment in treatment facilities
- Carried to local streams and parks for restoration of water environment
2. Water Recycling

Reclaimed water is used for toilet flushing, carried to the local streams, and so on.
2. Water Recycling

We sell reclaimed water (sand filtered water) to public works contractors.
2. Water Recycling

Around 1996, filtered water was mainly used for cleaning sewers and dust prevention. Nowadays it is used for cleaning roads and washing construction sites.
Thank you for your attention.
Initiatives for Sewerage BCP in Yokohama City

Environmental Planning Bureau
City of Yokohama
1. About Us: Yokohama City

2. Development of Sewerage BCP*

3. Implementation of Sewerage BCP*

*BCP: Business Continuity Plan
1. About Us: Yokohama City

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2. Development of Sewerage BCP*

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*BCP: Business Continuity Plan
2. Development of Sewerage BCP

March 11, 2011  Great East Japan Earthquake

Minamigamou Wastewater Treatment Center in Sendai City

Damaged plant

Damaged grit separator
Main pumping facilities in Minamigamou WTC.

The walls collapsed and the pillars inside were curved.
2. Development of Sewerage BCP

Support in the affected areas
(First stage survey in Sendai City)

Field survey

Visual confirmation
Inside manholes
2. Development of Sewerage BCP

When a disaster occurs,

✔️ What should we, who are in charge of sewage works, do?

✔️ Our supervisors may also be affected.

✔️ Can we deal with it on our own initiatives, even without their instructions?
After supporting in affected areas, we recognized the need of:

- **Imagery rehearsal** under severe conditions such as no resources or tsunami in order to respond to unexpected damages
- **Regular drills and trainings** in simulated disaster

Development of Business Continuity Plan
2. Development of Sewerage BCP

BCP: Business Continuity Plan

Conceptual diagram

Occurrence of disaster

Operational level

Before developing BCP

After developing BCP

Responding to a disaster

Time

0% - 100%
2. Development of Sewerage BCP

Under the following circumstances:

✓ Shortage of resources: manpower, equipment, fuel, etc.
✓ Little or no information
✓ Damaged utilities

To minimize the damage:

✓ Out of service
✓ Deterioration of sewerage function

Who? By when? Do what? To what extent?

→ Action Plan: Sewerage BCP
2. Development of Sewerage BCP

1. March, 2013 -
The working group started considering the framework of BCP.

Framework of BCP

Proposal from the working group (2012. 8)

2. September, 2012 -
Each working group worked for developing BCP.

Operational groups of BCP

Main office WG
Treatment facility WG
Sewer WG

All departments related to sewage works
* Main office
* 18 Public works offices
* 11 WTPs
* 2 STPs

Sewerage BCP of Yokohama - Earthquake and Tsunami: First edition (2013. 3)
2. Development of Sewerage BCP

Lessons from Great East Japan Earthquake

1. First priority

It is going to be difficult to continue working, if there is no one engaged in the sewage works in case of disaster.

→ Biological safety of human body

2. Damage from tsunami

Due to the tsunami along with Great East Japan Earthquake the treatment facilities were severely damaged and shut down. The functional decline continued for a long time.

→ Including measures against tsunami in BCP
1. About Us: Yokohama City

2. Development of Sewerage BCP*

3. Implementation of Sewerage BCP*

*BCP: Business Continuity Plan
3. Implementation of Sewerage BCP

High-Priority Tasks

We have to continue to provide sewage services in case of disaster.

We need to deal with

1. Toilet issues
2. Overflow of wastewater
3. Transportation systems
4. Discharge of raw sewage
5. Inundation
3. Implementation of Sewerage BCP

Spiral Up of Sewerage BCP based on 4 plans

What damage? [Damage]
Who? Do what? [Priority task]
By when? To what extent? [Target time]

Plan for emergency

1. Emergency response plan
2. Prior measure plan
3. Educational training plan
4. Maintenance and improvement plan

Plan for ordinary day
### 3. Implementation of Sewerage BCP

#### Emergency response plan

<table>
<thead>
<tr>
<th>No.</th>
<th>ワークフロー番号</th>
<th>対応時期（時間）</th>
<th>担当班</th>
<th>部署</th>
<th>非常時優先業務</th>
<th>行動内容</th>
<th>業務目標（成果）</th>
<th>対応場所</th>
<th>参照文書類（文書、マニュアル類）</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>管復1</td>
<td>～6時間</td>
<td>下水道管路復旧班</td>
<td>管路復旧班の設置</td>
<td>対策本部立上げ</td>
<td>本部体制の確立</td>
<td>関内中央ビル</td>
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<td>2</td>
<td>管復2</td>
<td>～6時間</td>
<td>下水道管路復旧班</td>
<td>職員の安否確認</td>
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<td>3</td>
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<td>下水道管路復旧班</td>
<td>台帳準備（その他の管路）</td>
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<td></td>
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</tbody>
</table>

**Priority task**

**Time**

**Detailed action**

**Location**

**Department**

**Goal (Result)**

**Related documents (manuals, etc.)**
3. Implementation of Sewerage BCP

   → Organizing the work strategically in case of disaster

2. Agenda (FY2013)
   (1) Entrenching Sewerage BCP
       - Creating detailed procedures
   (2) Securing lacking operational resources
       - Securing a hub and utilities
   (3) Developing structure
       - Contact structure and method of conveying information

Considering detailed and effective ways after the drills
3. Implementation of Sewerage BCP

Map exercise – Sewerage BCP

☑ Date: November 20, 2013 13:00 – 17:15
☑ Method: Map exercise (RPG method)
☑ Estimated duration: Right after the occurrence – Three days after
☑ Contents: Operation of crisis-response meeting for sewerage recovery

Information gathering/conveying, discussion on urgent matters, PR
3. Implementation of Sewerage BCP

**Issues:** what we learned from the drills

- Creating the manuals
  - which link to effective response to the disaster
- Improving the drills
- Prior measures
  - (working environment, office equipment, etc.)
3. Implementation of Sewerage BCP

1. Developing Sewerage BCP (Plan)
   1) Emergency response plan
   2) Prior measure plan
   3) Educational drill plan
   4) Maintenance and improvement plan

2. Conducting drills and trainings based on each plan (Do)

3. Conducting inspections based on maintenance and improvement plan (check)

4. Revising Sewerage BCP based on inspections (Act)

Spiral Up based on PDCA cycle
After developing the Sewerage BCP, we recognize the following.

- The simulated situation is just one of the numerous situations that may happen in the future.
- It is important to improve responding abilities to disaster.
- The principle of developing BCP is to discuss various matters among us.
Thank you for your attention.