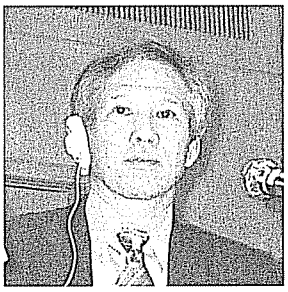
Presentation

Mr. Akira Tanabe
Director
Water Quality Research Laboratory
Water Treatment Department
Waterworks Bureau, Kitakyushu

Chairperson (Mr. Hiroto Oda)

Now we would like to start the afternoon session. We are going to have a presentation by Mr. Tanabe of Kitakyushu City. Mr. Tanabe, please.

Mr. Akira Tanabe (KITAKYUSHU)



Ladies and gentlemen, I am Akira Tanabe. I work for the Water Quality Research Laboratory of the Waterworks Bureau of Kitakyushu City.

Kitakyushu is located about 60㎞ east of Fukuoka City. We have tourist attractions such as Space World and the Moji Retro District. If you have time, please visit our city.

I would like to begin with an overview of waterworks in Kitakyushu. I will use an OHP to facilitate my explanation.

This shows the change in the service rate of Kitakyushu City. The city's water service industry has about a 90-year history; it started supplying water for the former city of Moji in 1911. The former cities of Yahata, Kokura, Tobata, Moji and Wakamatsu consolidated to create the city of Kitakyushu. About 30 years ago, 5 years after the consolidation, we provided water service to a little over 75% of the area. Recently, that rate has surpassed 99%, covering almost the entire city.

This shows the locations of water service facilities in the city. They are divided into 2 groups. One is the western part colored in blue; and the other is the eastern part shown in red. They are different not only in water sources and distribution areas but also in water quality. Water source for the western part is the Onga River which is the main source, the Rikimaru Reservoir, the Tonda Reservoir and the Hata Reservoir. In the eastern part, in order to diversify water sources as well as to strike a balance of water supply and demand between the west and east, we began the conveyance of 59,000㎥/day from the Yamakuni River, roughly 50㎞ away from the city. That was in 1998. We also have the Aburagi Reservoir, the Masubuchi Reservoir, the Murasaki River Underflow Water and the Dobaru Reservoir.

In the western part, there is the Ano Water Purification Plant which treats water mainly from the Onga River and the Rikimaru Reservoir. There's also the Honjo Water

Purification Plant for water from the lower basin of the Onga River and the Tonda Reservoir, and the small-scale Hata Water Purification Plant for the Hata Reservoir. In the eastern part, we have the Ideura Water Purification Plant for treating water from the Yamakuni River as well as the Aburagi and Masubuchi Reservoirs. The Dobaru Water Purification Plant treats water from the Dobaru Reservoir through slow filtration; and the Kuzumaki Water Purification Plant is where chlorination is conducted for underflow water of the Murasaki River. These plants are scattered around the city. Diversity of water sources is one of the characteristics of Kitakyushu, which gives us an advantage. This allows us to deal with emergencies or accidents that affect water quality by changing sources.

This chart is an overview of water service facilities. Over 60% of the total water volume for Kitakyushu City is taken from the Onga River water system. The amount of treatment given and process used at each water treatment plant vary, as you see on the chart. Rapid filtration is the main process used, but slow filtration is adopted at the Dobaru Water Purification Plant; and only chlorination is carried out for underflow water at the Kuzumaki Water Purification Plant. Currently, the population of Kitakyushu is about 1 million. For thoselmillion people, our total supply capacity is 769,000㎥/day.

This is a picture of the Masubuchi Reservoir with a storage capacity of 12 million ㎥. The population is low around the Yamakuni River, the Masubuchi Reservoir and the Aburagi Reservoir in the eastern area. Therefore, water quality is high and we have few problems with water treatment management.

This is the Onga River estuary dam. The river, the main water intake source for the western area, provides about 60% of our water. Approximately 700,000 people live along its basin and the population density is about 700/㎢, which is 2 times the national average. Contamination is worsening due to the inflow of urban drainage. Especially because of the influence of the estuary dam, water tends to stagnate at the intake sites causing proliferation of algae and rising pH levels. This also increases organic matters that generate trihalomethane, sometimes resulting in undesirable water quality in terms of water treatment management.

This is the Tonda Reservoir pumping water from the Onga River. The Tonda Reservoir is made up of two smaller reservoirs, the first and second reservoirs, and you can see the Hibiki Sea here. This reservoir is near the Onga River estuary, and its storage capacity is around 9 million ㎥. Since this reservoir also pumps water from the lower basin of the Onga River, eutrophication often causes water bloom, resulting in malodor and bad tasting water.

This chart shows a comparison of TOC, nitrogen and phosphorus contents in water sources. As seen on the chart, the water of the Onga River is more contaminated than that of other reservoirs or of the Yamakuni River. This is a graph for the Tonda Reservoir pumping water from the Onga River. The value of TOC is a little lower and so are the values for phosphorus and nitrogen due to sedimentation and propagation of algae in the

reservoir. Still, its turbidity is higher than other sources.

Water quality testing of the Onga River is performed 4 times per month. Along with a survey by depth, the quality test is performed once a month at all reservoirs.

This is the Ideura Water Purification Plant I mentioned earlier. It treats water from the Yamakuni River, the Aburagi Reservoir and the Masubuchi Reservoir, which all have good water quality. Therefore, treatment is easy and causes few problems. The landscape around the reservoir is rustic and has the atmosphere of a typical Japanese rural area.

This is the Dobaru Water Purification Plant. It performs slow filtration treatment on the good quality water coming from the Dobaru Reservoir by using organisms, not chemicals. Slow filtration requires a good quality water source as well as a large site. The water tastes good but its treatment capacity is much smaller than other plants'. Currently this plant produces about 4,000㎥ of water per day.

This is the Honjo Water Treatment Plant, which I introduced on the map. The Honjo and the Ano Water Treatment Plants primarily take water from the Onga River and the Tonda Reservoir. Therefore, especially during the summer, treatment becomes difficult due to high pH levels and an increase in organic matter caused by the proliferation of algae and its consumption of carbon dioxide in the water. High pH levels at both plants are countered by the injection of carbon dioxide or by changing coagulation from aluminum polychloride to aluminum sulfate.

This is a facility for injecting powdered activated carbon. At the Ano and the Honjo Water Treatment Plants, the water's foul smell and taste and the increase in organic matter as well as trihalomethane are countered by the infusion of powdered activated carbon. A water quality test is performed once a month at each water treatment plant, testing pH levels, turbidity, color, TOC, trihalomethane and so forth of the raw water, sedimentation basin, filtration basin and purified water. Also pH levels, turbidity, color and alkaline levels are automatically measured at each plant. At the Ano and the Honjo Water Purification Plants, where low quality water is taken from the Onga River, we perform an additional weekly test and are engaged in quality management. Using these water quality test results, and with the goal of reducing the amount of organic matter, malodor, bad taste and trihalomethane, we determine the amount of activated carbon to add, change the water source or take other measures.

This is the Water Quality Research Laboratory I work for. It is the only institute that performs water quality tests. Therefore, the laboratory is striving to provide water in cooperation with the staff at each water treatment plant. This is our staff conducting a water quality test. The test items exceed 150.

Next, let me talk about water quality testing of tap water. As for tap water, 40 city employees are charged with the task of checking its residual chlorine, turbidity and color. Also at the laboratory, detailed tests are conducted twice a month for heavy metals, torihalomethane and coliform groups at 20 selected sites with large water consumption

volumes, such as gas stations. Also, in response to various complaints about tap water from citizens, the laboratory carries out about 80 tests annually.

Now I will explain water quality conservation measures for water sources. The following measures are taken in river basins and water sources to conserve and improve the water quality of the water source.

As for measures to clean up rivers, the Ministry of Construction that manages the Onga River purifies contaminated branches of the river in urban areas by means of a method that utilizes the natural treatment ability of living organisms. This slide shows how it works. In this method, contaminated water is passed through a facility containing gravel; microorganisms, which cling to the gravel, purify the water. The treated water is returned to the Onga River.

The ministry also organized a liaison committee to conduct educational activities to ensure water quality of the Onga River, and to enforce countermeasures to prevent the outflow of oil and other substances which accompany accidents that affect water quality. Kitakyushu City is cooperating with these efforts. Water service workers of the Onga River water system formed an independent organization. They work towards river purification through such activities as emergency communication during accidents that affect water quality, and information exchanges to prevent the inflow of noxious substances into the river from industrial waste disposal sites.

Just like Fukuoka City, as you saw in the video, Kitakyushu City is also promoting forest conservation. Based on the recognition that conservation of forests surrounding the water source regions of the Onga River is crucial for water source preservation, the city and the organization I have just mentioned, along with NGOs, are actively participating in forest conservation activities, such as reforestation, cutting undergrowth and cleaning river sites. This is a photograph of tree planting activities at the upper reaches of the Onga River.

Next let me introduce treatment facilities for reservoirs and water sources. A pneumatic water pump was installed in the Tonda Reservoir. By supplying air down to the bottom of the reservoir, our aim is to facilitate water circulation and prevent the liquidation of manganese, ammonia nitrogen and phosphorus resulting from the anaerobic state at the bottom of the reservoir in the summer, as well as to curb the propagation of algae. Since the Tonda Reservoir pumps water from the nutritional salt rich Onga River, the propagation of blue-green algae tends to produce water bloom as you see in this slide; it also produces a musty odor. Accordingly, we are trying to purify the water quality by adding copper sulfate to destroy the algae.

Because tap water has a direct bearing on the life and health of our citizens, we drew up a manual, arranged by risk level, to deal with accidents affecting water quality and are striving for early-stage accident resolution and damage prevention.

In closing, I will list the challenges that Kitakyushu will still have to address.

Firstly, the development and education of personnel to assure more reliable water quality management in our city water, and the passing on of technical know-how such as data analysis and evaluation.

Secondly, establishment of operational standards for advanced treatment facilities based on bio-activated charcoal to improve the raw water quality at Honjo Water Purification Plant currently under construction.

Thirdly, the laboratory has to pay attention also to the handling of pathogenic microorganisms, such as crptospridium and endocrine disrupters.

Finally, promoting investigation and research to supply better tasting water that meets the diverse needs of citizens.

That concludes my presentation. Thank you very much for your kind attention.

(Applause)

Discussion

Chairperson (Mr. Hiroto Oda)

Thank you very much, Mr. Tanabe from Kitakyushu. He has explained the overview of the water service industry, as well as water quality management methods and water quality conservation measures for water sources. Their careful treatment in accordance with intake water quality and water quality conservation measures in cooperation with other organizations and citizens are of great help to other cities. Are there any questions about the presentation?

Mr. Shin Sung-Kyo (PUSAN)

I would like to know the ratio of drinking water in Kitakyushu. In other words, how much bottled water is consumed compared to tap water and ground water from wells for private use? Would you please provide that information?

Chairperson (Mr. Hiroto Oda)

This is a question about what type of water people consume, including bottled water and tap water. Would you answer the question, Mr. Tanabe?

Mr. Akira Tanabe (KITAKYUSHU)

As for groundwater, few people use it in Kitakyushu. Many people drink bottled water. I think the number of people who drink water directly from the tap is low. Usually they boil it before drinking it or making tea. Unfortunately, I do not know the exact figures.

Chairperson (Mr. Hiroto Oda)

Thank you. Few people drink underground water. Some drink bottled water; others drink tap water only after boiling it. I hope this answers your question, Mr. Shin.

Mr. Shin Sung-Kyo (PUSAN)

I would like to add that raw water is quite contaminated in Pusan. Therefore, we've introduced powdered activated carbon treatment and ozone treatment, and supply water that has been treated at advanced treatment facilities. Also we continue to survey citizens through annual questionnaires to learn the amount of tap water used, including drinking boiled tap water. The results show that, despite the large cost of advanced treatment, around 40% of citizens drink tap water, including boiled tap water. This is because the quality of raw water is basically deteriorating. The rest drink ground water from wells or bottled water. It is important to strive for treatment. But what is most important is how to secure clean raw water, as well as water sources, in a way that is practicably as stable as it was before the social development or urbanization of rural areas. This is what the experience of Pusan indicates.

Chairperson (Mr. Hiroto Oda)

Thank you very much. Since raw water is contaminated in Pusan, they supply water after advanced treatment. However, those who drink tap water account for only 40%. How to prevent the contamination of raw water seems to be an important issue. Thank you again. Any other questions?

Mr. Jiang Xiong Cheng (DALIAN)

I am from the Dalian Water Supply Company. I have listened with great interest to the report by Mr. Tanabe from the Waterworks Bureau of Kitakyushu City on the water service industry and water quality. Seventy to eighty percent of the water Dalian supplies to citizens is also taken from dams. And I understand that Kitakyushu is also taking its water basically from reservoirs. In the report, he mentioned the problems of algae and ammonia nitrogen. Would you please briefly explain the design and installation of the pneumatic water pump? We are eager to learn from excellent experiences. Thank you.

Chairperson (Mr. Hiroto Oda)

Thank you. This is a question from Dalian about the design of a pneumatic water pump. Mr. Tanabe from Kitakyushu, please.

Mr. Akira Tanabe (KITAKYUSHU)

I do not know much about the mechanical design. All reservoirs, including the

Tonda Reservoir, have a problem in summer called stratification. When the temperature is high, water at the lower and upper parts of a reservoir does not mix. Thus, organic matter in water and mud at the bottom of the reservoir dissolves and consumes oxygen and, we think, causes phosphorus and other substances in the mud to dissolve and become nutrients in the water. Therefore, our plan is to curb the propagation of algae by stirring up the water in the reservoir. Roughly one cycle takes a week.

Chairperson (Mr. Hiroto Oda)

Thank you very much. Fukuoka City also installed pneumatic water pumps at 5 of its 7 dams. Though it has not been so long since the installations, their efficiency is evident. Are there any other questions?

Mr. Wong Kee Wei (SINGAPORE)

My question is about dealing with algae and ammonia nitrogen. In our deeper reservoirs, we also carry out aeration. Basically air is pumped into the reservoir so that the water at the bottom of the reservoir can rise and mix with the water near the surface. This significantly reduces algae growth as well as the amount of ammonia nitrogen.

But in Singapore, due to the sun blazing down throughout the year, we sometimes have algae problems in our shallow reservoirs, especially estuary reservoirs. When this occurs, we need to use copper sulfate as you do at the Tonda Reservoir. Copper sulfate kills algae but it will accumulate in the reservoir. So my question is, how do you control its dosage; and in your guideline what is the long-term implication of copper sulfate accumulation in reservoirs?

Chairperson (Mr. Hiroto Oda)

While aeration has a significant effect at reservoirs in Singapore, shallower reservoirs have algae problems, so the use of copper sulfate is necessary. In the long term, however, it accumulates at reservoirs. So he is asking about dosage and related issues. Mr. Tanabe from Kitakyushu, please.

Mr. Akira Tanabe (KITAKYUSHU)

The Japanese water quality standard prescribes that copper concentration be below 1mg/liter. However, crops, especially rice, react very sensitively to copper. Even a small dose effects and inhibits growth. The standard for water for agricultural use is 0.2mg/liter. Therefore, our concentration never surpasses that level. When we use copper sulfate, its concentration is below 0.1mg/liter. Especially for high quality water, the concentration is half that, around 0.05mg/liter. Even so, the effect is significant.

Chairperson (Mr. Hiroto Oda)

Thank you very much. The Japanese standard for copper sulfate is below 1㎎/liter. But considering the impact on crops, they try to keep its concentration below 0.1㎎/liter and, for high quality water, below 0.05㎎/liter. The minimal possible dose is used. Mr. Wong from Singapore has that answered your question?

Mr. Wong Kee Wei (SINGAPORE)

Thank you very much.

Presentation

Mr. Nguyen Viet Son
Manager of Planning and Investment Department
Transport & Urban Public Works Service of HCMC
Ho Chi Minh City

Chairperson (Mr. Hiroto Oda)

Next we will have a presentation from Mr. Nguyen Viet Son of Ho Chi Minh City.

Mr. Nguyen Viet Son (HO CHI MINH)

Ladies and gentlemen, good afternoon. I am very happy to make a presentation at this Asian-Pacific City Summit Working Level Conference. I would like to speak about the general outline of Ho Chi Minh City and the Water Supply Company.

Vietnam is an ASEAN member country, located in Indochina, on the side of the East China Sea. It consists of 61 provinces and cities and Ho Chi Minh City is one of the 2l argest cities. The other is Hanoi. With an area of around 2,000㎢, the city has 17 inner districts and 5 suburbs. Its population was over 5 million as of the end of 1998. The city is an economic, financial, trade and industrial center of Vietnam.

In terms of economic aspects, the GDP of Ho Chi Minh City was 63 trillion, 623 billion VND in 1998 and its growth rate was 9.0-9.2%. The average per capita income is 1,000 USD/year compared with the national average of 300 USD/year. The standard of living for the city inhabitants has been significantly improved, leading to increasing water demands.

The supply of clean water for the residents' domestic use started long ago when Ho Chi Minh City was still called Saigon. Under French colonial rule, water was mainly taken from shallow aquifers. The city adopted French technology and formed a network of many shallow and central wells connected by pipes. The total amount of intake