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DEVELOPMENT OF THE DISTRIBUTION PIPES INVESTIGATION ROBOT

Minoru Yokoya [1], Tsutomu Takeishi [2]
1. Bureau Of Waterworks, Tokyo, Japan
2. Bureau Of Waterworks, Tokyo, Japan

Tokyo Waterworks Bureau is carrying out reinforcement of transmission and distribution pipes and replacement of aged pipes, for to prevent turbid water and leakage. We usually replace pipes based on the plan made according to pipe material and age. But on large pipes, such as transmission and distribution mains, we decide priority and repair-method based on the pipe-inside investigation. However, we usually empty distribution mains, because investigators need to get into the mains for the investigation. As a result, large quantity of drinking water is wasted for empty and water suspension extends to long-term and large area. In cases of the mains without substitution, even investigation is not easy.

Therefore we developed the Robot that is able to investigate pipe-inside condition without suspension of water supply. The Robot is composed of a main body, an insertion device, a monitor, picture record devices, cables, etc. The main body is inserted through air valves (with a diameter of 100mm) and investigation is possible of water speed less than 2.0m/s and water pressure less than 0.75MPa. The main body has 4 propellers (for 4-directions), 2 cameras, laser pointer, lights, etc, and movement is possible with operating 4 propellers in all courses by monitoring operator. 2 cameras are microminiature CCD of 380,000 pixels, one is for driving, another one is for investigation, can turn 360 degrees. Laser pointer is possible to measure by comparing the observe size with a gauge, such as crack width and surplus space between pipe joints. Lights are LED that has a long life at high brightness.

Furthermore we carried out a field experiment with distribution pipes (with a diameter of 1,100mm) to confirm a function of the Robot. As a result, we confirmed high performance of it.

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A NOVEL LABORATORY CULTIVATION METHOD TO EXAMINE ANTIBIOTIC RESISTANCE RELATED MICROBIAL RISK IN URBAN WATER ENVIRONMENT

Hyangkyun Oh, Jaejin Lee, Kangseok Kim, Joonkyu Kim, Younkyoo Choung, Joonhong Park
1. Department Of Civil and Environmental Engineering, Yonsei University, Seoul, South Korea

Because of the highly mobile nature of antibiotic resistant genes among different microbial species, the presence of antibiotic resistant bacteria in water possibly causes to an increased appearance of antibiotic resistant pathogenic microbes. In this context, detecting antibiotic resistant microorganisms is an important task in evaluating microbial risk in water environment. However, culture-dependent methods using high nutrient conditions, which is currently being used in evaluating microbial risk, may not be suitable, because some of microbes in water are not cultivatable under high nutrient conditions. In this work, we invented a novel cultivation method to detect antibiotic resistant microbes in a wide range of nutrient levels. Using the newly developed method, we examined antibiotic resistance related microbial risk in a urban water environment.

A high nutrient medium LB (Luria-Bertani Broth) was diluted at a wide range of dilution factors (100-104), and either tetracycline(100㎍/ml) or vancomycin (8㎍/ml) was amended. The new method was able to detect previously-known oligotrophic bacteria in drinking water samples. In addition, when analyzing swine manure samples the new method successfully detected antibiotic resistant oligotrophic microbes. These strongly supported the validity of the new method in detecting antibiotic resistant microbes in a wide range of nutrient levels. When the newly developed method was applied in evaluating antibiotic resistance in Han River, Seoul, vancomycin resistant microorganisms (545 ± 445 CFU/ml) were detected while no tetracycline resistant antibiotic microorganisms were detected. Only 0.004% of vancomycin resistant microorganisms in the river came from all the municipal wastewater plants (MWTPs) near the river.

This indicates that non-point pollution sources other sources than MWTPs led to the occurrence of the antibiotic resistant microorganisms in Han River. In addition, according to the chemical analysis of various antibiotic compounds including vancomycin, tetracycline, and ampicillin, their concentrations in the water environment were too low to select the antibiotic resistant bacteria. This suggests that the occurrence of the antibiotic resistant microorganisms might be attributed to some unknown compounds or environmental factors other than antibiotics exposure in the environment.