

## Development of a robot for the management of wastewater treatment facilities

Whole term

1992. 10~1997.3

### (Purpose)

A robot was developed in 1992 and there were excellent results. A survey to determine the necessity of a robot to be used for the management of wastewater treatment facilities (over 800 mm pipe diameter) was conducted. In 1993, referring to the results obtained in 1992, the basic idea of a robot to investigate/clean a pipe of 800~1200mm in diameter, was arranged. In 1994, methods to improve and the method of cleaning the robot were determined. In addition, the basic movement-test was conducted and how to improve the robot was investigated. In 1995, a method of cleaning the robot and a way of utilizing the robot effectively for the aforementioned task were investigated. In addition, the construction of a device capable of making the advance and return movements of the robot, in order to load the robot onto the existing investigating unit was examined.

In this year, investigations were conducted for utilization of the robot and for the overall management.

### (Results)

The results in 1996 were as follows:

#### 1) Investigation of the robot

In that year, the navigating part and the device for making the advance and return movements of the robot were improved, and the navigation, reaction, traction and stepped pulley etc. were investigated. In addition, investigations were conducted for utilization of the robot and for the overall management.

- (1) Tire diameter was enlarged from 75mm to 150mm to improve the performance of climbing of the stepped pulley.
- (2) Second navigating equipment was made to go to the upper part of the pipe with relatively low drying sewage which slides easily.
- (3) The robot body and the device for making the advance and return movements of the robot were unified to be effective, and the stroke of the device mentioned above was made longer to be compatible with a diameter of 800~2000mm without metal fittings.
- (4) The result of the navigating test after the improvement showed some slope.
- (5) The backward motion needed less force than the forward motion.
- (6) The maximum height that the stepped pulley climbed to was 3 cm in case of the accelerated first velocity.
- (7) The cable, velocity adjustment, reinforcement of legs and the safety measure in case of an actual development of utilization were examined.

#### 2) Cleaning of the robot

In the same year, the checklist for utilization consisted of less number of items, and there was an improvement in the effectiveness and the condition of waterproof. In addition, a measure in case of a sudden explosion was presented and the overall flow was examined.

- (1) In case of cleaning a 240m span, 85 robots had been needed for the investigation in the previous year and it was twenty eight in the year of this investigation.
- (2) A vacuum hose was expected to be used in order to improve the effectiveness; however, it was not available.
- (3) Measures in developing the robot as a real device in order to ensure the waterproof ability and to overcome an explosion during utilization were suggested.

Collaborators: Sewage Technical Development Meeting

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Keywords

Maintenance and Management of sewer systems, Investigation, Cleaning, Robot