

Investigation research on master plan related to construction of Yamanaka Town sewer

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(Purpose)

The sanitary sewage of the Yamanaka Town district is planned to flow into sanitary relay pump station in the flatland region by passing through the main local road of Sitakamootsu line. However, it will pump up about 80m at actual pump head, because the ground high of the district in the mountain is TP+250 ~ 290m, while ground high of the connection site in the flatland region is TP+327m.

Moreover, there are some risks of hydrogen sulfide arising and water rotting for the sewage remained in sewer due to small plan sewage discharge. In addition, the road in the district is complicated with Shira river and the tributary, and the crossing river is required in the multiple positions.

Considering such condition, this study decides sewer plan taking account of water pumping utilities which is optimum for this district and decrease of bacterial spoilage countermeasure.

(Result)

Extreme high lifting height is necessary for transfer pump installed in the investigated mountain district. In such case, there are many examples of installing the conventional relay pump station. However, it was examined as a countermeasure by using manhole pump (the removable underwater sewage pump), because largest drainage discharge is as small as $0.003\text{m}^3/\text{s}$ during the plan period.

1. Water pumping utilities

1) Number of pump is considered as 2 units, which 1 unit is used as reserve.

2) Examination of the pumping station number.

If the pumping stations are less, it will be economic on construction cost, maintenance cost, and moreover, it is also easy for the maintenance. In the meantime, with the high actual pump head, and about 1.8km long of the transfer distance, the selection of pipe kind and making water hammer countermeasure, etc. will be difficult.

In this research, according the number of spots of equipped pumping station, the 1 spot plan (using the new developing super high lifting head pump), 2 spots plan (using the high lifting head pump), the 5 spots plan (the conventional pump) of 3 plans were examined.

In the 1 spot plan, because the actual lifting head also reaches about 100m, the present submerged sewage pump can be not correspondent. Therefore, the new development of pump must be carried out, and there is a problem for correspondence to the trouble, while there is the possibility of being considerably high expensive due to more development time at present.

Though it is possible to use the conventional pump used widely for the 5 spots plan, the total cost of construction and maintenance including the manholes installation will rise.

There is no technical problem especially for the 2 plots plan using the pump which is not very much usually used. And it is the most economical in 3 plans, and moreover ease to maintenance should be also adopted.

In addition, the total head which considered head loss in pipes and valves such as actual lifting head is about 47m. It is considered that this is the head which is approximate to the technical limit to present submerged sewage pump.

2. Countermeasure of rotting prevention

In the case of initial small rate of inflow, hydrogen sulfide control measure is the necessity in service area and discharge spot. Therefore, that Oxygen implantation system, air mixing system, and drug injection system were examined. The oxygen implantation system should be adopted, when considering functions, equipment cost, maintenance and so on.

(Future problem)

In this research, submerged sewage pump which can correspond by present technology is adopted, and technology development of submerged pump is also examined which the super high head can get to about 100m.

As foundation, we want to contribute to the development of the technology.

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Key Words

Deep draft sewage submersible pump, manhole pump, sewer putrefaction countermeasure