The Study on H_2S Suppression Technologies in Sewer Force Mains

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(Purpose)

Recently, Hydrogen sulfide (H_2S) generation in sewer force mains induce serious maintenance problems. One of countermeasure technologies for the sewer pipe corrosion is the H_2S suppression technology. The technologies in practical use include gas injection and chemicals adding countermeasures. These technologies respectively have some problems, such as differences are seen in the effect of measures depending on operating methods of sanitary sewage pumps, volume of flow water, and so on. On a basis of the problem consciousness, we have focused on four technologies (air injection, oxygen injection, nitrate adding and the polyferric sulfate adding), and set up purposes of the study. The first purpose is organizing recommended conditions with technical feature. The second is presenting design method to solve some problems.

(Results)

(1) Air injection technology

Since it has a simple system and strictly air injection volume controlling is not needed, when you try to suppress H_2S, you should give first priority to study air injection technology. However, if a declivous part is longer, pressure loss clearly exist, enough preliminary examinations must be needed. In the study, we tried to reduce assuming electric power with an intermitting air injection. An examination result shows good suppression effect as well as with a continuous injection, when a suppression potential with a continuous injection has enough margins.

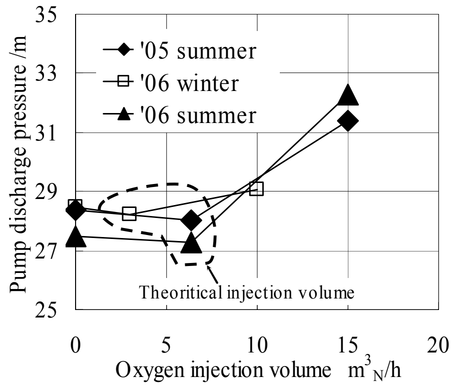

Figure 1 Pressure loss

(2) Oxygen injection technology

In the case as mentioned above, oxygen injection technology is a satisfactory option. Therefore, an injection volume is small in relation to air injection technology. In the study, we examined a suppression effect at two actual sewer force mains. In the result, depending on slope profile and operating conditions of sewer pumps, there may be some cases to need two or three times to logical injection volume to produce effects. In addition, if an injection volume is over than logical volume, a pressure loss rising occurred as well as air injection technology (Figure 1).

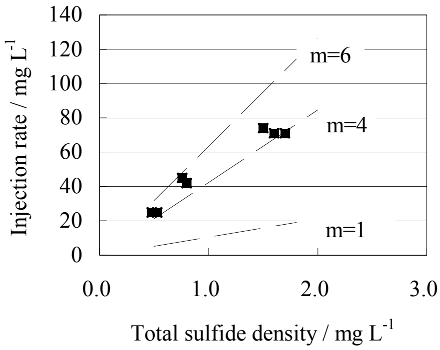

Figure 2 Empirical factor of poryferric sulfate adding

(3) Nitrate adding technology

Nitrate adding technology is able to apply to conditions which a margin of pressure loss is small, because adding chemical is liquid. Therefore, it keeps suppressed condition longer. We have studied about a suppression effect in a condition which has an extremely long detention time, over 1 day. Under such conditions, it was known that a volume of adding nitrate loosed touch with existing predicting relation. In fact, examination results showed 30-40% lower than prediction relation.

(4) Poryferric sulfate adding technology

Because the suppression principle of poryferric sulfate adding technology is coagulation removal, this technology should be selected if much inflows of H_2S from the upstream exists or main purpose is cut-down of H_2S already generated at upstream parts. Moreover, the reduction of the water processing load in the downstream can be expected because phosphorus in sewage can be removed as the sub-effect. Adding ratio is stoichiometrically defined basically with sulfide ion concentration. However, sewer contains other materials which use iron ion. More adding ratio need to suppress H_2S. Empirical factor is defined as required adding ratio divided by theoretical adding ratio. We confirmed a range of empirical factor(m) as 4 to 6 (Figure 2).

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