A semi-empirical approach for quantifying $H_2S(g)$ emission rates in gravity sewers

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A semi-empirical approach for quantifying $H_2S(g)$ emission rates in sewers is presented. Hydrogen sulphide emission kinetics as a function of hydraulic parameters were measured in the laboratory using methods adopted from flocculation theory. A flocculation unit was used to impart selected velocity gradients ($G$) into the water, and sulphide concentrations were measured with time. Regression analysis was used to fit the emission rate equation against $G$. Following this, $G$ was linked to head loss in sewers. Finally, the hydraulic and kinetic models were linked (via $G$) to derive an equation for the hydrogen sulphide emission rate along a sewer line.

The model can be used to predict $H_2S(g)$ emission in sewers under uniform flow conditions, and the effects of parameters such as pH, sewer slope and proportional depth can be calculated. An example of a theoretical run obtained for constant slope and pH while varying the proportional depth is given. The model was developed for a straight-line flow; a correction can be adopted for bends and other local head losses.