APPENDIX C4. DESIGN OF A SEDIMENTATION TANK

Problem Formulation

Figure C4.1 shows the results of six different batch settling experiments (taken from Jørgensen, 1971). Find the area per m^3 of waste water for the six different precipitants on basis of a sludge concentration of 20 g / l. C_o = 1.1. g/l for precipitation with sulfuric acid and 1.4 g / l for precipitation with the other precipitants.

Solution

Figures C4.2. and C4.3 are constructed from Fig. C4.1 using equations (11.52) and (11.53). The area is found by the use of equation (11.54). The results are summarized in Table C4.1.

Table C4.1.

Calculations of areas needed per m^3 of waste water to obtain a sludge concentration of 20 g / l

Precipitant	W_s-min kg / h m^2	C_o g / l	Area m^2	C_s by add. settl. g / l	Chemical g /l
1.Sulfuric acid	0.06	1.1	18.2	48	0.02
2.Aluminum sulfate	0.15	1.4	9.3	72	0.1
3.Glucose trisulfate	0.15	1.4	9.3	90	0.1
4.Sulfite liquor	0.83	1.4	1.7	78	0.1
5.Lignin sulfonic acid	0.83	1.4	1.7	78	0.1
6. 3+10% azoprotein	1.32	1.4	1.1	102	0.1

The results show that precipitant number 6 is far the best due to the fast settling. The example shows furthermore, the importance of the use of polyflocculants. The more rapid settling implies that the need for settling area is reduced significantly.

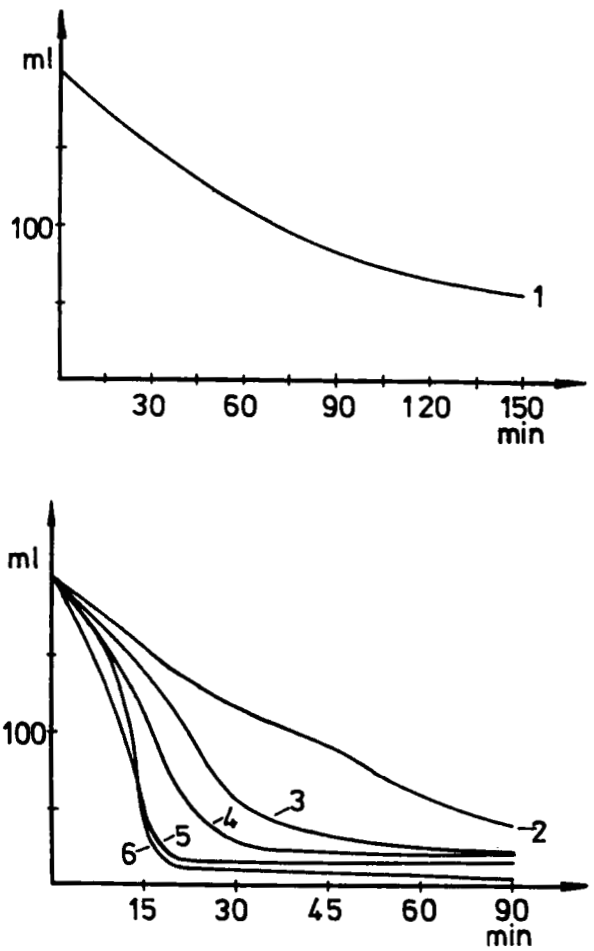

Figure C4.1. Settling is plotted versus time for precipitation with six different precipitants. The number used are explained in Table C4.1.

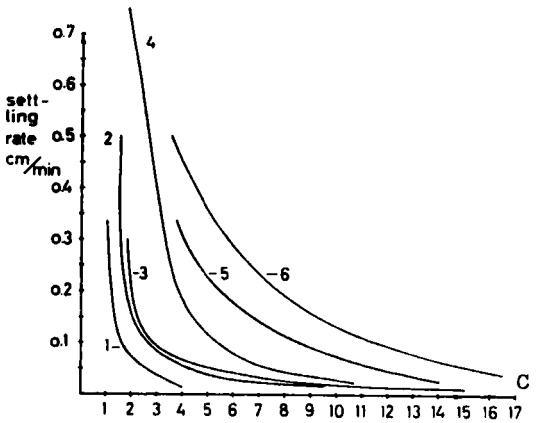

Figure C4.2. Settling rate in cm / min. is plotted versus the slurry concentration at the transition layer for the six precipitants. The numbers refer to the precipitants explained in Table C4.1.

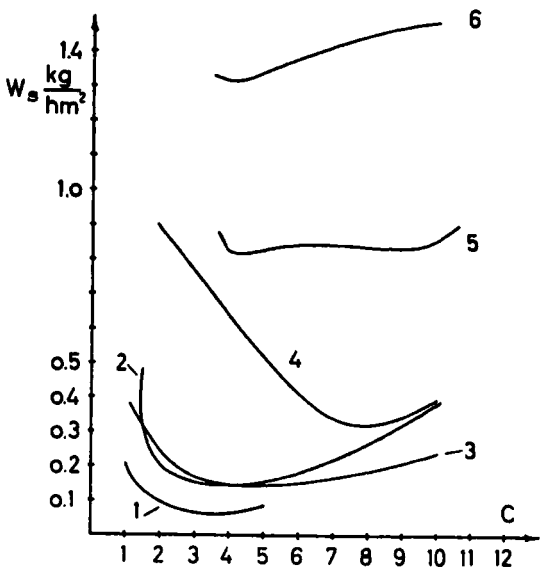

Figure C4.3. Weight of solid produced kg / h m^2 ,W_s , for different values of C = concentrations of solid in the transition layer. Numbers see Table C4. 1.