TubeFloc - Equations

Equation 1

$$1 - \frac{N}{N_0} = \frac{(N/N_0)_{\max}\, t}{K_S + t}$$

or it also can be represented as:

$$\frac{N}{N_0} = \frac{K_S + t - (N/N_0)_{\max}\, t}{K_S + t}$$

where
N is the effluent turbidity [-]
No is the maximum/initial effluent turbidity during settling state [-]
$(N/N_0)_{max}$ is the maximum value that the hyperbolic function will asymptomatically approach to.
t is the time [T]
K_S is the rate of settling flocs [T].

Terminal velocity is the velocity of the flocs settling in the column.

$$v = \frac{L}{t}$$

where
v is the terminal velocity [L/T^2]
L is the distance of the column above turbidimeter [L]

t can be redefined as:

Equation 2

$$t = \frac{d}{v}$$

substitution of Equation (2) in Equation (1) yields:

Equation 3

$$1 - \frac{N}{N_0} = \frac{(N/N_0)_{\max}\, L}{K_S v + L}$$

Reciprocating both axes in Equation 3 gives:

Equation 4

$$1 \Big/ \left(1 - \frac{N}{N_0}\right) = \frac{K_S v}{(N/N_0)_{\max}\, L} + \frac{1}{(N/N_0)_{\max}}$$

For the experimental data that is less than number of window specify (at lower end), Equation 5a is used and Equation 5b is used at the upper end.

Equation 5a

$$\frac{\sum_{j=0}^{2i} Y_j}{2i + 1}$$

Equation 5b

$$\frac{\sum_{j=2i-n+1}^{n-1} Y_j}{2n - 2i - 1}$$

For any other experimental data in between these two condition, Equation 6 is used.
Equation 6

$$\frac{\sum_{j=i-m}^{i+m} Y_j}{w}$$

where
w is the number of window (odd number)
Y is the data
n is the length of experimental data
m is (w-1)/2