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Institut für Umweltingenieurwissenschaften
Institute of Environmental Engineering
Chairs of Urban Water Management

Errata

W. Gujer: Systems Analysis for Water Technology (Springer, 2008)

Notes on the handling of this document:

> This document lists the errata and inconsistencies discovered in the book “Systems Analysis for Water Technology” by Willi Gujer (Springer, 2008). Modifications are marked in **bold**, unless otherwise specified. Any comment on additional content errors would be gladly accepted by the teaching assistants or professors of the Chairs of Urban Water Management.

Table of Contents

Chapter 4.2.5 p.59

$$u^* = \sqrt{\frac{\boldsymbol{\tau_0}}{\boldsymbol{\rho}}} = \sqrt{g \cdot R \cdot I_E} \qquad (4.19)$$

Chapter 5.2 p.79

…For one material (here marked with the index i*) we can freely select the dimensionless stoichiometric coefficient ν_{i*} (see below), which fixes the dimension of the process rate ρ to $[M_{i*}\,L^{-3}\,T^{-1}]$ and also of all other stoichiometric coefficients to $[M_i\,\mathbf{M_{i*}^{-1}}]$.

Chapter 6.5 p.112

u(t) = velocity of flow (**Q(t)/A**) $[L\,T^{-1}]$

Chapter 6.5. p.114

For second order (n=2): $C_{A,out}^{-1} = C_{A,in}^{-1} \mathbf{+} k_2\theta_h$

Chapter 6.6-6.9 p.119-126

Note: The figure numbering for the following figures was incorrect in the book, but the cross-references were correct.

New Fig. 6.1**8**

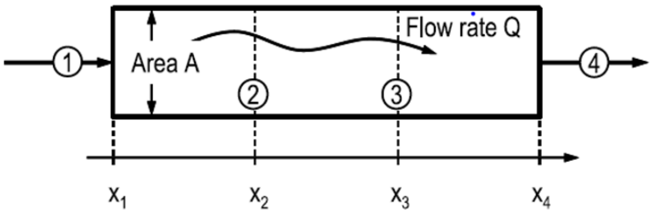


Fig. 6.18 Sampling points in a plug-flow reactor with turbulence. In the influent (1) and in the effluent (4) advection is dominant; inside the reactor (2) and (3) turbulence is to be considered

New Figure 6.1**9**

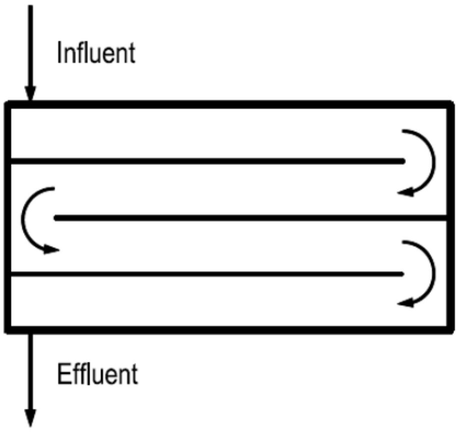


Fig 6.19 Example of the design of a plug-flow reactor with turbulence. The flow is directed by the inserted guidance walls, so that a longitudinal current develops. This configuration of the reactor can be retrofitted to an existing fully mixed basin

New Figure 6.**20**

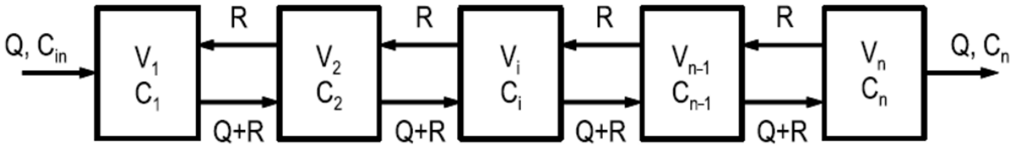


Fig. 6.20 Transformation of a plug-flow reactor with turbulence into a series of completely mixed compartments

New Figure 6.**21**

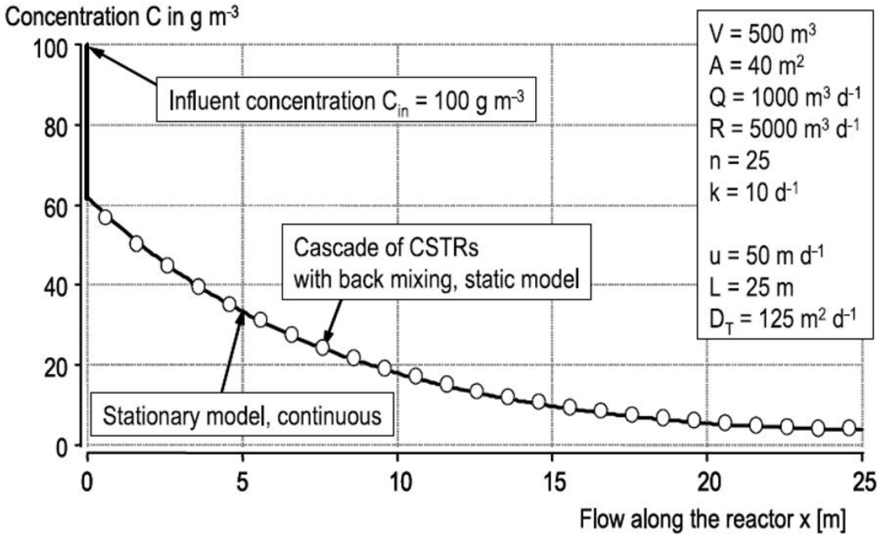
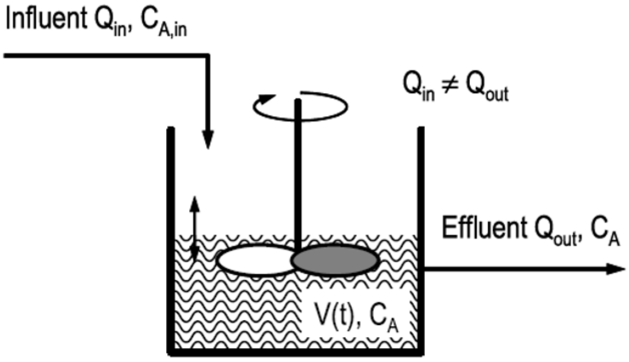


Fig. 6.21 Comparison of the prediction of the stationary model (Eq. (6.14), Example 6.17) with the discretized version of the dynamic model (Example 6.19, Eq. (7.39)

New Figure 6.**22**



Characteristics of an SBR:
- influent and effluent may differ
- variable volume
- ideal mixing
- effluent concentration = concentration in the reactor
- the steady state corresponds to a CSTR
- open system

Fig. 6.22 Schematic illustration and characteristics of a sequencing batch reactor (SBR)

New Figure 6.**23**

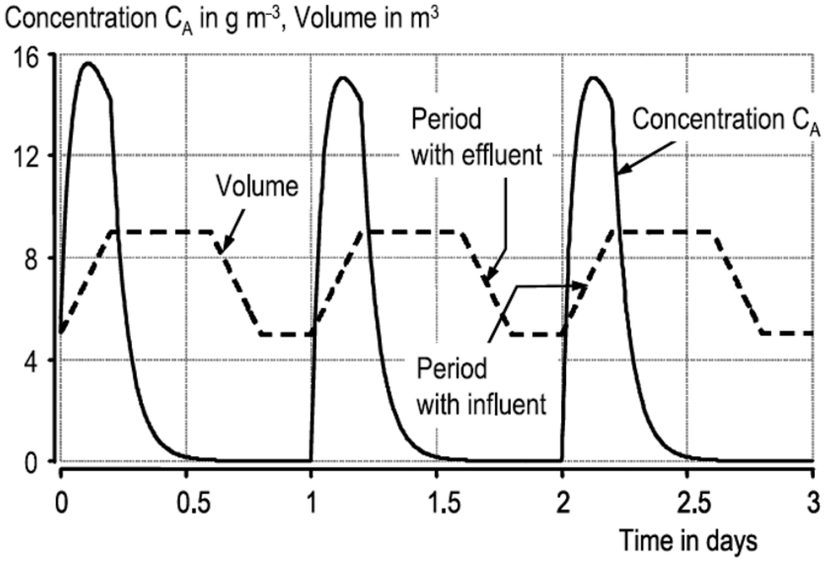


Fig. 6.23 Change of the concentration and the volume in a sequencing batch reactor (SBR) with a first-order degradation process over three cycles (see also Example 6.23)

New Figure 6.**24**

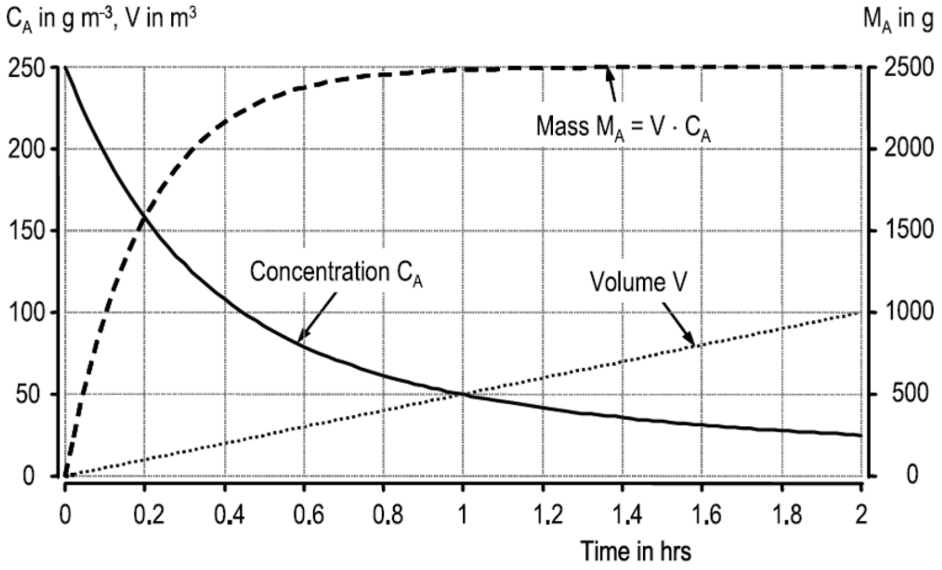


Fig 6.24 Progress of the volume as well as the concentration and the mass of material A in an SBR with constant influent and a first order degradation reaction (see also Example 6.21 for an analytical solution)

Chapter 7.4.1 p.143

$$f(\tau) = f(t - t_0) = \frac{Q \cdot S_A(t - t_0)}{E_A} = \frac{\mathbf{Q \cdot S_A(\tau)}}{\mathbf{E_A}} \qquad (7.18)$$

Chapter 9.4.1 p.185-186

$$\frac{\partial X_{BF}}{\partial t} = \frac{j_{Degrad,BF} + j_{Erosion,BF}}{\mathbf{R_h}} \qquad (9.3)$$

Corrections to the variables defined on p.186:
R_h= hydraulic radius (**A/U**) [L]
h_m= mean depth (**A/W**) [L]

Chapter 9.4.4 p.197

$$V_B \cdot \frac{dS_G}{dt} = j_G \cdot \mathbf{A_B} = -k_l \cdot \left(\frac{S_G}{H} - S_W\right) \cdot A_B \qquad (9.25)$$

Chapter 9.4.4 p.198

For spheres one has $\frac{A_B}{V_B} = \frac{6}{\phi_B}$ (where ϕ_B is the diameter) and thus

$\boldsymbol{\tau < \ln(1-0.99)\cdot\frac{H\cdot\phi_B}{k_1\cdot 6}}$ **if $H > 0$ and**

$\boldsymbol{\tau > \ln(1-0.99)\cdot\frac{H\cdot\phi_B}{k_1\cdot 6}}$ **if $H < 0$.**

Chapter 10.3.4 p.222

Fig 10.10 Bode diagram for a stirred tank reactor, drawn for the dimensionless reaction rate of $k \cdot \theta_h = 3$. The points 1-3 refer to the three pictures in Figure 10.6, **where 1= bottom, 2= middle, 3= top.**

Chapter 11.3.1 p.244-245

Example 11.4:

i	x_i in gN m^{-3}	τ_i for n = 6	τ_i for n = 5
1	17.6	**0.71**	**0.88**
2	17.6	**0.71**	**0.88**
3	18.9	**1.93**	- eliminated in the first step
4	17.9	**0.10**	**0.77**
5	18.0	**0.10**	**1.32**
6	17.7	**0.51**	**0.33**

For n = 6 one has m_x = 17.95 gN m^{-3} s_x^2 = 0.243 **(gN)^2 m^{-6}**

s_x = 0.493 gN m^{-3} τ_{krit} = 1.73

For i = 3 we obtain $\tau_i > \tau_{krit}$. This value is eliminated from the series as an outlier.

For n = 5 one has m_x = 17.76 gN m^{-3} s_x^2 = **0.033 (gN)^2 m^{-6}**

s_x = **0.182** gN m^{-3} τ_{krit} = 1.64

Chapter 12 p.257

…In addition we want to gain information on the uncertainty o**f** our model predictions.

Chapter 12.1.1 p.260

$$\sigma_{m,i}^2 = \frac{X^2}{n-n_p} = \frac{\mathbf{n}}{\mathbf{n-1-n_p}}\cdot x_{rms}^2 \,. \qquad (12.4)$$

Chapter 12.3.2 p.273

$\mathrm{I} = \mathrm{I}_{\max} \cdot (-\mathbf{cos}(\mathbf{2} \cdot \boldsymbol{\pi} \cdot \mathbf{t})), \mathrm{I} > 0$, available light energy in W m^{-2}

Chapter 13.7.3 p.354

Table 13.7 *(only part of table shown)*:

Parameters from the unstable controller, $K_{P,krit}$ = 1.69, T_{krit} = 0.54								
1	P	**0.85**	-	-	2.37	0.82	1.3	3.8
2	PI	**0.76**	**1.70**	-	1.99	0.23	1.6	2.3
3	PID	**1.01**	**3.76**	**0.068**	1.99	0.13	1.8	2.2

Chapter 14.11.4 p.390

New Value for A_3 = **5.17**

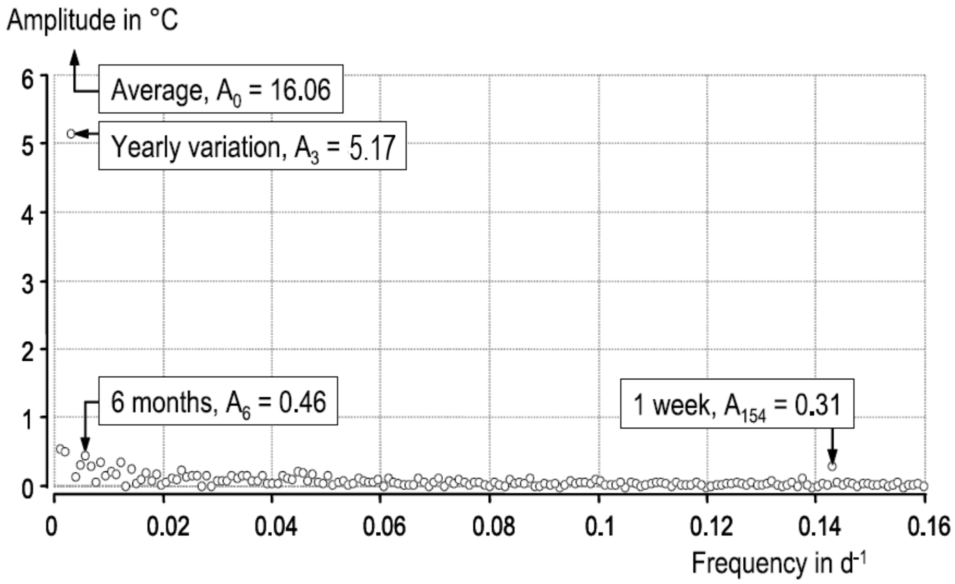


Fig. 14.25 Frequency spectrum of the measured temperatures (FFT, Berkeley Madonna)

Chapter 16.16 p.434

Derive the hydraulic residence time distribution for the ozonation/disinfection reactor in Sect. **16.9**. Compare the results for 2, 6 and 30 reactors in series.

Chapter 16.23 p.439

2. During a rain event the following characteristics of the influent apply (time in seconds): Qin=0.1*(1+squarepulse(0,1000)), Cin=1-0.5*(squarepulse(**0**,1000).

Chapter 16.28 p.443

New: Influent **B**

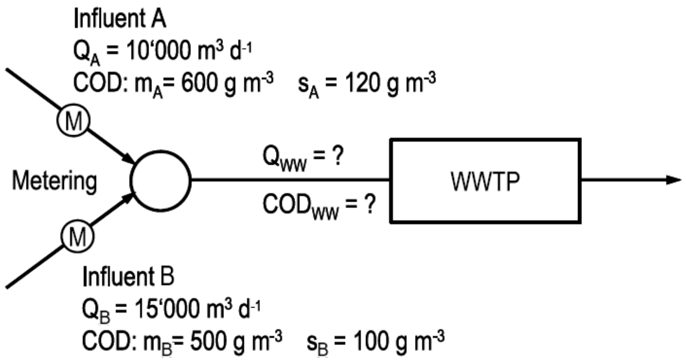


Fig. 16.8 Influent of two wastewater streams to a wastewater treatment plant. The value of the mean, flow weighted COD concentration is uncertain with a coefficient of variation of 20%

Index p.459-460

A

activated sludge
    system **320, 353**

L

logistic growth model **374**