

STEADY STATE RESULTS FOR OPENLOOP

(Results from Matlab/Simulink implementation by Dr Ulf Jeppsson, IEA, Lund University, Sweden, May 21 2009 based on Matlab R2008b (ver 7.7.0))

Influent characteristics

SI = 30 mg COD/l
SS = 69.5 mg COD/l
XI = 51.2 mg COD/l
XS = 202.32 mg COD/l
XBH = 28.17 mg COD/l
XBA = 0 mg COD/l
XP = 0 mg COD/l
SO = 0 mg -COD/l
SNO = 0 mg N/l
SNH = 31.56 mg N/l
SND = 6.95 mg N/l
XND = 10.59 mg N/l
SALK = 7 mol HCO3/m3
TSS = 211.2675 mg SS/l

Flow conditions

Influent flow to WWTP = 18446 m3/d
Influent flow to AS = 92230 m3/d
Internal recirculation = 55338 m3/d
Settler feed flow = 36892 m3/d
Returned sludge flow = 18446 m3/d
Wastage sludge flow = 385 m3/d
Effluent flow = 18061 m3/d

Input to AS

SI = 30 mg COD/l
SS = 14.6116 mg COD/l
XI = 1149.1183 mg COD/l
XS = 89.3302 mg COD/l
XBH = 2542.1684 mg COD/l
XBA = 148.4614 mg COD/l
XP = 448.1754 mg COD/l
SO = 0.39275 mg -COD/l
SNO = 8.3321 mg N/l
SNH = 7.6987 mg N/l
SND = 1.9406 mg N/l
XND = 5.6137 mg N/l
SALK = 4.7005 mol HCO3/m3
TSS = 3282.9402 mg SS/l

Reactor 1

SI = 30 mg COD/l
SS = 2.8082 mg COD/l
XI = 1149.1252 mg COD/l
XS = 82.1349 mg COD/l
XBH = 2551.7658 mg COD/l
XBA = 148.3894 mg COD/l
XP = 448.8519 mg COD/l
SO = 0.0042984 mg -COD/l
SNO = 5.3699 mg N/l
SNH = 7.9179 mg N/l
SND = 1.2166 mg N/l
XND = 5.2849 mg N/l
SALK = 4.9277 mol HCO3/m3

TSS = 3285.0039 mg SS/l

Reactor 2

SI = 30 mg COD/l
SS = 1.4588 mg COD/l
XI = 1149.1252 mg COD/l
XS = 76.3862 mg COD/l
XBH = 2553.3851 mg COD/l
XBA = 148.3091 mg COD/l
XP = 449.5227 mg COD/l
SO = 6.3132e-05 mg -COD/l
SNO = 3.6620 mg N/l
SNH = 8.3444 mg N/l
SND = 0.88206 mg N/l
XND = 5.0291 mg N/l
SALK = 5.0802 mol HCO3/m3
TSS = 3282.5463 mg SS/l

Reactor 3

SI = 30 mg COD/l
SS = 1.1495 mg COD/l
XI = 1149.1252 mg COD/l
XS = 64.8549 mg COD/l
XBH = 2557.1314 mg COD/l
XBA = 148.9413 mg COD/l
XP = 450.4184 mg COD/l
SO = 1.7184 mg -COD/l
SNO = 6.5409 mg N/l
SNH = 5.5479 mg N/l
SND = 0.82889 mg N/l
XND = 4.3924 mg N/l
SALK = 4.6748 mol HCO3/m3
TSS = 3277.8534 mg SS/l

Reactor 4

SI = 30 mg COD/l
SS = 0.99532 mg COD/l
XI = 1149.1252 mg COD/l
XS = 55.6940 mg COD/l
XBH = 2559.18 mg COD/l
XBA = 149.5271 mg COD/l
XP = 451.3147 mg COD/l
SO = 2.4289 mg -COD/l
SNO = 9.2990 mg N/l
SNH = 2.9674 mg N/l
SND = 0.76679 mg N/l
XND = 3.8790 mg N/l
SALK = 4.2935 mol HCO3/m3
TSS = 3273.6327 mg SS/l

Reactor 5

SI = 30 mg COD/l
SS = 0.88949 mg COD/l
XI = 1149.1252 mg COD/l
XS = 49.3056 mg COD/l
XBH = 2559.3437 mg COD/l
XBA = 149.7971 mg COD/l
XP = 452.2111 mg COD/l
SO = 0.49094 mg -COD/l

SNO = 10.4152 mg N/l
SNH = 1.7333 mg N/l
SND = 0.68828 mg N/l
XND = 3.5272 mg N/l
SALK = 4.1256 mol HCO₃/m³
TSS = 3269.8370 mg SS/l

Settler underflow

SI = 30 mg COD/l
SS = 0.88949 mg COD/l
XI = 2247.0504 mg COD/l
XS = 96.4143 mg COD/l
XBH = 5004.6542 mg COD/l
XBA = 292.9200 mg COD/l
XP = 884.2737 mg COD/l
SO = 0.49094 mg -COD/l
SNO = 10.4152 mg N/l
SNH = 1.7333 mg N/l
SND = 0.68828 mg N/l
XND = 6.8972 mg N/l
SALK = 4.1256 mol HCO₃/m³
TSS = 6393.9844 mg SS/l

Settler effluent

SI = 30 mg COD/l
SS = 0.88949 mg COD/l
XI = 4.3918 mg COD/l
XS = 0.18844 mg COD/l
XBH = 9.7815 mg COD/l
XBA = 0.57251 mg COD/l
XP = 1.7283 mg COD/l
SO = 0.49094 mg -COD/l
SNO = 10.4152 mg N/l
SNH = 1.7333 mg N/l
SND = 0.68828 mg N/l
XND = 0.01348 mg N/l
SALK = 4.1256 mol HCO₃/m³
TSS = 12.4969 mg SS/l

Settler internal (1 is top layer)

TSS1 = 12.4969 mg SS/l
TSS2 = 18.1132 mg SS/l
TSS3 = 29.5402 mg SS/l
TSS4 = 68.9781 mg SS/l
TSS5 = 356.0747 mg SS/l
TSS6 = 356.0747 mg SS/l
TSS7 = 356.0747 mg SS/l
TSS8 = 356.0747 mg SS/l
TSS9 = 356.0747 mg SS/l
TSS10 = 6393.9844 mg SS/l

Other variables

Trad. sludge age (XS + XP + XI + XBH + XBA in reactors) = 7.3155 days
Spec. sludge age (XBH + XBA in reactors and settler) = 9.1436 days
Total hydraulic retention time = 15.6118 hours
Reactor hydraulic retention time = 7.8053 hours
Thickening factor at bottom of settler (TSS_u/TSS_{feed}) = 1.9554
Thinning factor at top of settler (TSS_{eff}/TSS_{feed}) = 0.0038219

Dimensions

Reactor 1 is anoxic
Volume reactor 1 = 1000 m3
Reactor 2 is anoxic
Volume reactor 2 = 1000 m3
Reactor 3 is aerobic
Volume reactor 3 = 1333 m3
Reactor 4 is aerobic
Volume reactor 4 = 1333 m3
Reactor 5 is aerobic
Volume reactor 5 = 1333 m3
Settler height = 4 m
Settler area = 1500 m2
Settler volume = 6000 m3