Exercise 3
Actual MCRT Calculation

Use the attached worksheet to calculate the operating MCRT for the following conditions:

Aerobic Volume = 7.5 MG

Anoxic Volume = 2.5 MG

Aerobic Zone MLSS = 2500 mg/L

Anoxic Zone MLSS = 2500 mg/L

Sludge Wasting Rate = 0.5 MGD

Waste Sludge TSS = 0.75 %

Plant Flow = 40 MGD

Secondary Clarifier TSS = 13 mg/L

Calculation of Actual Mean Cell Residence Time

Required Input Data

Aeration Tank Volume

(1) Aerobic Volume , V_{AER} _____ MGal

(2) Anoxic Volume (if applicable), V_{ANOX} _____ MGal

Average MLSS Concentration

(3) Aerobic Zone, MLSS _____ mg/L

(4) Anoxic Zone (if applicable), $MLSS_{ANOX}$ _____ mg/L

(5) Sludge Wasting Rate, Q_W _____ MGD

(6) Waste Sludge Solids Concentration, TSS_W _____ mg/L TSS

(7) Clarifier Effluent Flow, Q_E _____ MGD

(8) Clarifier Effluent TSS, TSS_E _____ mg/L

Determine Mass of Solids in Anoxic Zone

(9) $M_{ANOX} = (V_{ANOX})(8.34)(MLSS_{ANOX})$

(10) $M_{ANOX} = (\_\_\_\_\_)(8.34)(\_\_\_\_\_) = \_\_\_\_\_$ lb

Enter from line (2) Enter from line (4)

Determine Mass of Solids in Aerobic Zone

(11) $M_{AER} = (V_{AER})(8.34)(MLSS_{AER})$

(12) M_{AER} = (_____)(8.34)(_____) = _____ lb

Enter from line (1) — Enter from line (3)

Determine Mass of Solids Removed from System in Waste Sudge

(13) $M_W = (Q_W)(8.34)(TSS_W)$

(14) M_W = (_____)(8.34)(_____) = _____ lb/day

Enter from line (5) — Enter from line (6)

Determine Mass of Solids Removed from System in Plant Effluent

(15) $M_E = (Q_E)(8.34)(TSS_E)$

(16) M_E = (_____)(8.34)(_____) = _____ lb/day

Enter from line (7) — Enter from line (8)

Determine Overall MCRT

(17) $$MCRT = \frac{(M_{ANOX} + M_{AER})}{(M_W + M_E)}$$

Enter from line (10) — Enter from line (12)

(18) MCRT = $\frac{(\_\_\_\_\_ + \_\_\_\_\_)}{(\_\_\_\_\_ + \_\_\_\_\_)}$ = _____ days

Enter from line (14) — Enter from line (16)

Determine Aerobic MCRT

(19) $$MCRT_{AER} = \frac{(M_{AER})(MCRT)}{(M_{AER} + M_{ANOX})}$$

Enter from line (12) — Enter from line (18)

(20) $MCRT_{AER} = \frac{(\_\_\_\_\_)(\_\_\_\_\_)}{(\_\_\_\_\_ + \_\_\_\_\_)} = \_\_\_\_\_$ days

Enter from line (12) — Enter from line (10)

Determine Anoxic MCRT

(21) $$MCRT_{ANOX} = (MCRT) - (MCRT_{AER})$$

(22) $MCRT_{ANOX} = (\_\_\_\_\_) - (\_\_\_\_\_) = \_\_\_\_\_$ days

Enter from line (18) — Enter from line (20)