Nitrifying Activated Sludge Wastewater Treatment Plant Workshop Problem No. 7 Calculate the F/M Ratio, Sludge Age, and SVI for Basin No. 2 Two basins are in service (Basins No. 1 an No. 2)

Final Workshop Problem for 2 or 3 students:

Use the following data and attached worksheets to calculate F/M Ratio, Sludge Age (SA), SRT, and SVI_(30 min) for a single aeration basin (Basin #2). The aeration basins were sized and designed for nitrification. The plant consists of two (in service) basins. Primary Clarifiers are operating ahead of the basins.

Flows and Loadings

Total Primary Effluent flow to both basins 3.0 MGD or 1.5 MGD per basin.

Primary Effluent BOD concentration is 150 mg/L.

Primary Effluent TSS concentration is 125 mg/L.

Assume flow, BOD, and TSS loadings are split evenly between basins

Effluent Flow from Basin #2 is also 1.5 MGD.

Effluent TSS is 4.7 mg/L

Basin #2 Data

Basin #2 capacity is 0.700 MG

MLSS 3,500 mg/L

MLVSS 3,018 mg/L

RSSS/WSSS concentration is 6,370 mg/L

Wasting Rate 38 gpm for 24 hours per day

(estimated/calculated from Basin #2)

30 minutes settling test 300 ml/L

Desired F/M Ratio 0.11

Desired SA 14.0 Days

Desired SVI < 100

Desired SRT 9.0 Days

Additional Information:

Return Sludge Flow Rate is 99%

Detention Time at 1.5 MGD is 11.2 hours

Required Worksheets:

(Task 1) Worksheet #6 "Flow-Thru Activated Sludge Processes, Organic Loading and F/M Ratio"

(Task 2) Worksheet #7"Flow-Thru Activated Sludge Processes Sludge Age and SVI"

Course and the first sections are the contract to the course of the cour	ow-Thru Activated Sludge Processes, Solids Retention Time"
For Extra Credit, you may Based on the information p	complete the following: provided, would you recommend any testing and/or operational changes?
	Student Name:

Worksheet #6	Demo for Workgroup	p Problem No. 7 Input Required				
Flow-thru Activat	ed Sludge Proce	Calculate Value				
Organic Loading	and F/M Ratio					
Use this Worksheet for a single in service basin. Calculate / estimate flow entering basin.						
Basin No. 2	Information	Student Name:				
Operating data (Orga	nic Loading and FM	// Ratio)_				
1.500 Flow to b	pasin, MGD	0.700 Basin Capacity, MG				
3,500 MLSS, r	ng/L8	86% % MLVSS 3,018 MLVSS, mg/L				
150 Influent	t or P.E. BOD, mg/l	93.6 Aeration Cap. In 1000 cu. Ft. (Basin Capacity, gals / 7.48)				
Pounds of BOD ente BOD in mg/L	ring basin # per gal water	Flow pounds of in MGD BOD/day				
X	8.34 x	= -				
Calculated Organic L	oading (ppd of BOI per day BOD /	D/1000 cu. Ft.) 1000 cu.ft. capacity =				
Pounds of (MLVSS) Mixed Liquor Suspended Solids						
MLVSS in mg/L	# per gal water 8.34 x	Capacity pounds of in MG MLVSS				
Food to Microorga						
pounds of	pounds of					
BOD/day	MLVSS	FM Ratio DESIRED FM Ratio 0.11				
to <u>increase</u> F/M increase wasting to <u>decrease</u> F/M decrease wasting						

Flow-thru Activated Sludge Processes Sludge Age (SA) and Sludge Volume Index (SVI) Use this Worksheet for a single in service basin. Calculate/ estimate flow entering basin. Basin No. 2 Information 1.500 Flow to Basin, MGD 3.500 MLSS, mg/L 125 Influent or P.E. TSS, mg/L 125 Influent or P.E. TSS, mg/L Pounds of TSS entering basin TSS # per gal Flow pounds of in mg/L water in MGD TSS/Day 8.34 x = Pounds of (MLSS) Mixed Liquor Suspended Solids MLSS # per gal Capacity pounds in MG MLSS in mg/L X 8.34 x = Pounds of (MLSS) Mixed Liquor Suspended Solids MLSS # per gal Capacity pounds in MG MLSS In mg/L water in MG MLSS MLSS # per gal Capacity pounds MLSS In mg/L Salada Ax = Sludge Ave (SA) Days (using MLSS) pounds pounds of MLSS TSS/Day SA Days DESIRED SA Days	Worksheet #	7	Demo for Work	group Pr	oblem No. 7		Input Required
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1.500 Flow to Basin, MGD	CA and CV/I Info	rmatio					
3,500 MLSS, mg/L 86% % MLVSS 3,018 MLVSS, mg/L							٦
TSS	1.500 Fid	ow to Ba	asin, MGD			0.700	Basin Capacity, MG
TSS	3 500 M	1 5 5 m	a/I	86%	2 0/ MI V/CC	3.018	MINSS mail
Pounds of TSS entering basin TSS # per gal Flow pounds of TSS/Day x 8.34 x = Pounds of (MLSS) Mixed Liquor Suspended Solids MLSS # per gal Capacity pounds in mg/L water in MG MLSS x 8.34 x = Sludge Ave (SA) Days (using MLSS) pounds pounds of MLSS TSS/Day SA Days /	3,300	LOO, III	g/L	00 /	70 IVILVSS	3,010] WEVSS, Mg/L
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TSS							
TSS							
in mg/L water in MGD TSS/Day **R.34 x = ** **Pounds of (MLSS) Mixed Liquor Suspended Solids** MLSS # per gal Capacity in MG MLSS **x		enterin			-		and the set
Pounds of (MLSS) Mixed Liquor Suspended Solids MLSS # per gal							· ·
Pounds of (MLSS) Mixed Liquor Suspended Solids MLSS # per gal	in mg/L				IN MIGD		TSS/Day
MLSS		X	8.34	×		- =	
MLSS							
MLSS	Pounds of (M	LSS) N	lixed Liquor	Suspe	nded Solid	S	
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Sludge Volume Index (SVI) 30 min MLSS, settling, ml/L mg/L		,	,	_			
Sludge Volume Index (SVI) 30 min MLSS, settling, ml/L mg/L	de	crease	wasting to raise			-	Days 14.0
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	_	,		X		-	
DESIRED SVI							DESIRED SVI
< 100							
,	30 min	me Ind	MLSS,	Y		=	SVI

Worksheet #8 Flow-thru Activat Solids Retention	Demo for Workgroup ed Sludge Proces Time (SRT)			nput Required Calculate Value		
Use this Worksheet for a basin. Calculate/ estima		Comments	:			
Basin No. 2	Information	Student Nar	me:			
SRT Information	Flow MCD		0.700 Basin Cana	soits MC		
1.500 Effluent	Flow, MGD		0.700 Basin Capa	icity, MG		
3,500 MLSS, r	mg/L		6,370 WSSS, mg	g/L		
38 Wasted	d Sludge, gpm	_	Wasted Sl	udge, MGD		
4.7 Effluen	t TSS, mg/L					
Pounds of (MLSS)	Mixed Liquor Susp	ended Solids				
MLSS in mg/L	# per gal water	Capacity in MG	pounds MLSS			
x	8.34 x		=			
Solide Wasted no						
Solids Wasted, pp WSSS	# per gal	Waste Sludge	WSSS			
in mg/L	water	in MGD	in ppd			
x	x		=			
Effluent TSS Wast	ed, ppd					
TSS	# per gal	Effluent Flow	TSS	*		
in mg/L	water	in MGD	Over Weir, pp	d		
x	8.34 x		=			
Total ppd Wasted (Waste Sludge and TSS Over Weir):						
WSSS	TSS Over Weir	Total Solids	_			
in ppd	in ppd	Wasted, ppd				
+	=					
pound: MLSS				DESIRED SRT Days 9.0		
SRT	/ vvasted	=		0.0		