

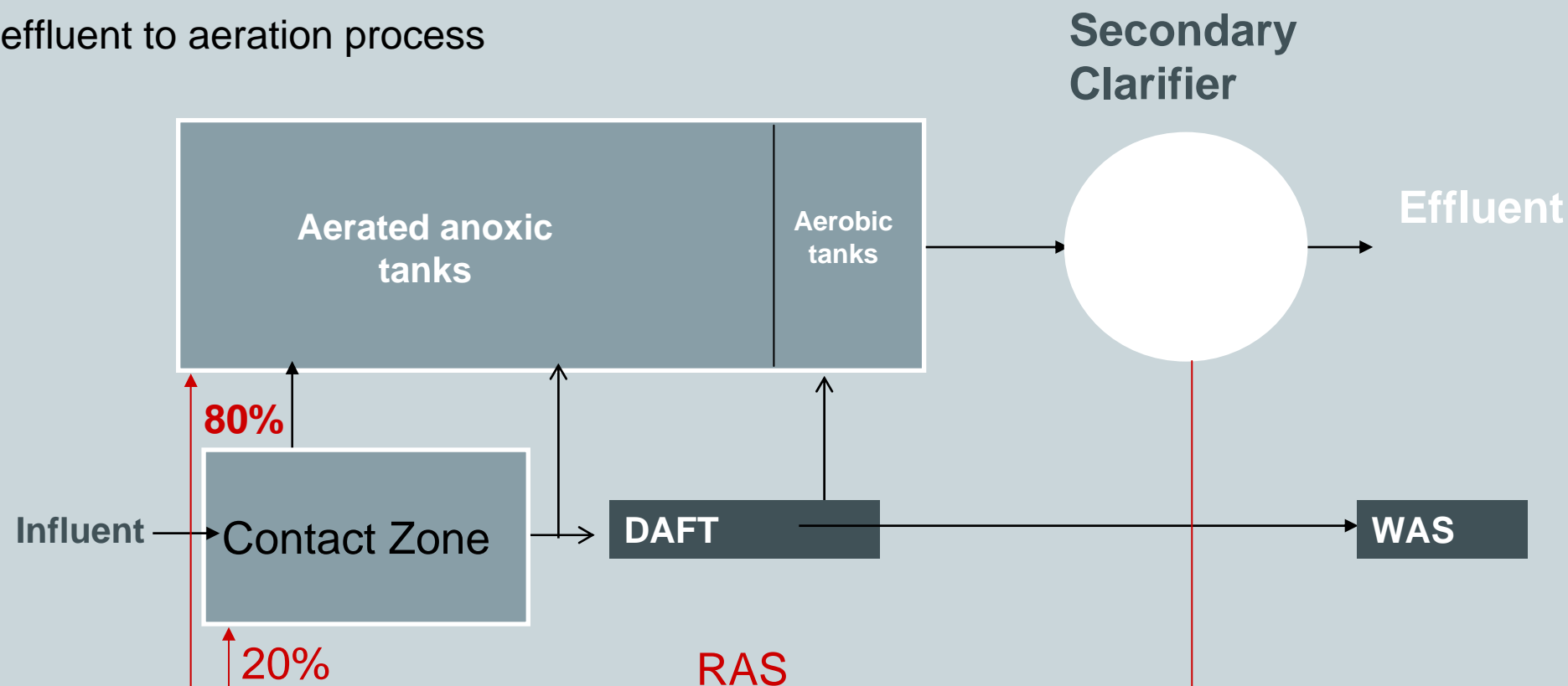
Captivator Process for Secondary Treatment

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Captivator Process

- Influent goes to contact aeration
- 20% of RAS to contact aeration
- 50/50 split of mixed liquor
- DAF effluent to aeration process



Basic Principles

- Intermix large amount of biomass with influent wastewater stream in contact aeration zone
- Absorb and enmesh incoming BOD in this zone
- Split mixed liquor flow from contact zone between base activated sludge process and DAF thickening tank

Background

Co-Thickening Study @ Renton WWTP

Prime-Float Testing @ Bethlehem WWTP

Prime-Float Testing @ Oconomowoc WWTP

Renton Study on Co-Thickening in DAFT Tanks

Study showed several key advantages for co-thickening

- 1) Adding primary sludge to DAFT did not effect treatment capacity of DAFT
- 2) Quicker removal of primary sludge reduced BOD load to aeration
- 3) Co-thickening eliminated grit problems in anaerobic digesters
- 4) Up to 80% of the soluble BOD (of primary sludge) removed in DAFT

80% Soluble BOD Removal?

Mixture of:

50,000 lbs/day of primary sludge @ 1% (0.6 mgd)

40,000 lbs/day of WAS

Soluble BOD in primary stream of 100 mg/l @ 0.6 mgd = 500 lbs/day

400 lbs removed per 40,000 lbs of WAS (100 lbs of WAS per BOD removed)

Increasing the Primary Flow Rate

Double the flow ... 1000 lbs of soluble BOD in contact

Ten times the flow ... 5000 lbs of soluble BOD in contact

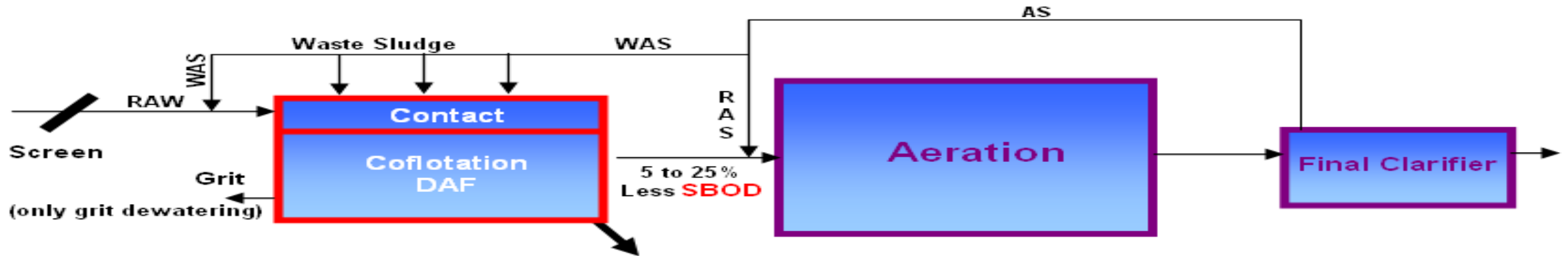
Fifty times the flow ... 25,000 lbs of soluble BOD in contact

Prime-Float

The DAFT becomes the primary clarifier ... and the co-thickener

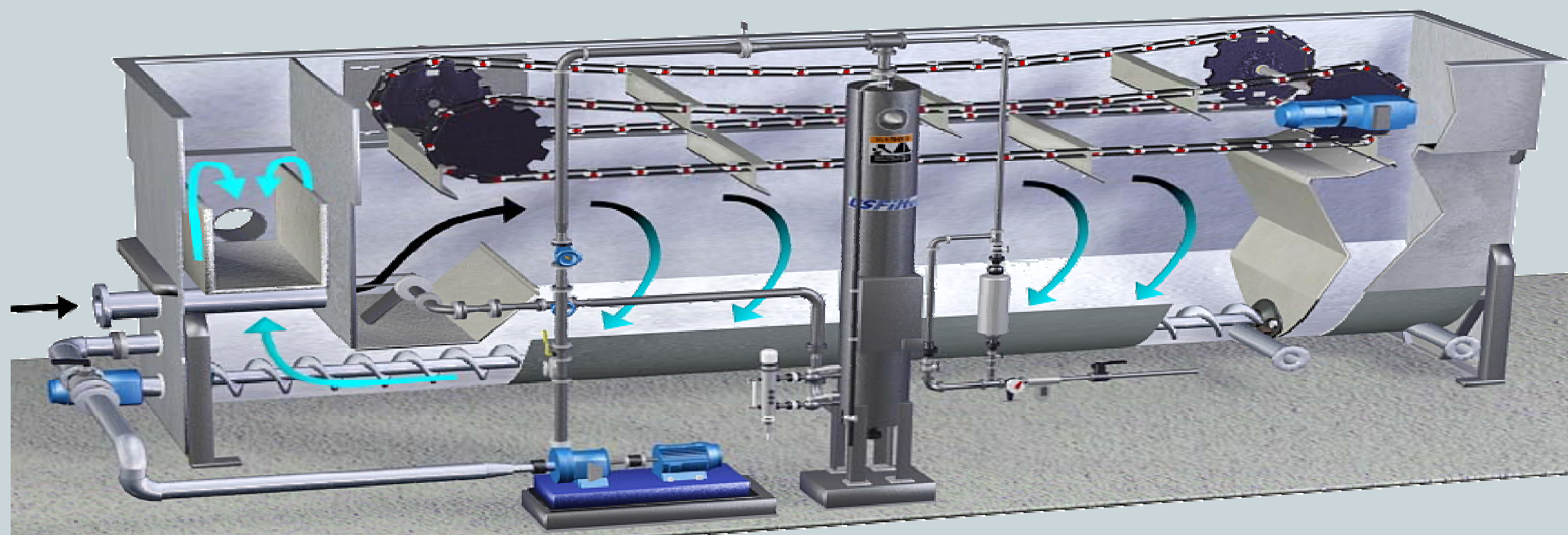
With “Folded-Flow” DAFT operating at 5000 gpsfd overflow rate

Prime Float® Schematic



Solids to be wasted (SS & Scum) @ 6% or higher
∴ Maximize stabilization sizing and eliminates a separate thickening unit process.
Early removal of **SBOD** improves stabilization performance.

DAF – Folded Flow® Design



DAF - Folded Flow[®] Float



By Combining DAF and WAS

Advantages you achieve:

- Having an 8 times higher **SOR** for primaries
- Eliminating the “**GRIT**” unit process
- Eliminating the “**THICKENER**” unit process
- Eliminating **up to 25%** of the **SBOD** to aeration
- Eliminating the influent **SCUM**
- Maximizes stabilization sizing by feeding at **6%**
- Reduces the land **FOOTPRINT**; 1/8 of primary SOR; no grit unit; no thickener unit; up to 25% reduction in aeration

Bethlehem Study

Side by side comparison with conventional primary

Average overflow rate of 5000 gpsfd

Ratio of WAS to soluble BOD @ 200/400 (0.5)

62% SS removal

28% sBOD removal

Oconomowoc Study

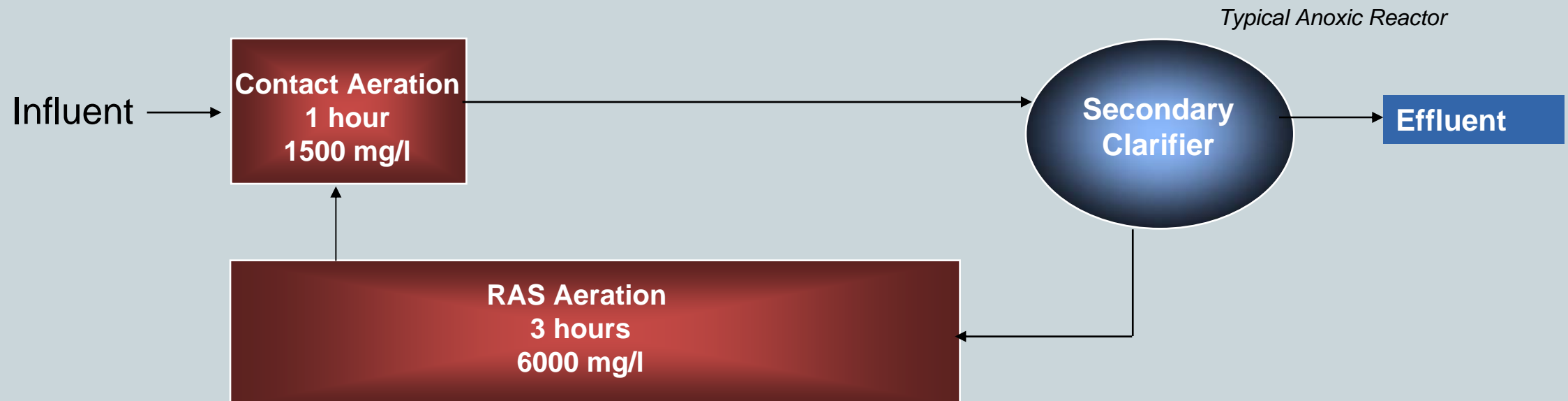


Adding Ferric results
in 93% SS removal

Contact Stabilization Process

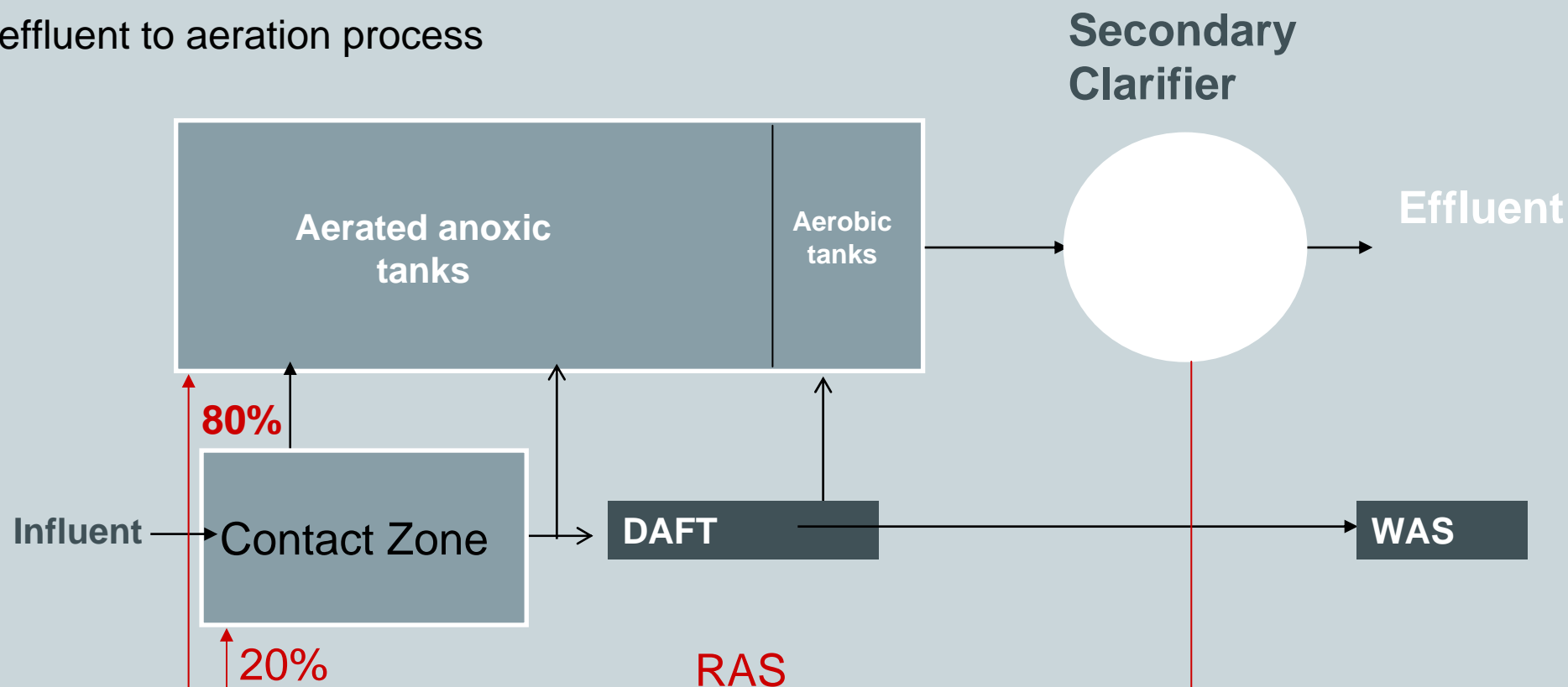
Ratio of biosolids to sBOD @ 10:1

Ratio of biosolids inventory (in contact aeration) to sBOD: 1:1



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Design of a 25 mgd plant

“TRADITIONAL DESIGN”

Using 200 mg/l of BOD

5 day SRT

3000 mg/l MLSS

200,000 lbs of biosolids

40,000 lbs of WAS

Upfront anoxic tanks/Fine Bubble Aeration

... 13.0 m-gal of aeration, 5.0 m-gal of FC, 1100 HP of power draw

Improved Design

Aerated Anoxic
Step-Feed
Hybrid Aeration

4500-2300 mg/l MLSS

... 10.2 m-gal. of aeration, 3.4 m-gal of FC, 800 HP power draw

Improved Design ... with Captivator

WAS increases by 37.5% (now @ 55,000 lbs/day)

Biological load to Aeration Process reduced by 50%

MLSS to FC @ 1600 mg/l

... 6.1 m-gal of aeration, 2.5 m-gal. of FC, 380 HP of power draw

Side-By-Side Comparison

	Traditional	Improved	W/Captivator
Aeration, M-gal	13.0	10.2	6.1
Final Clarifiers, M-gal	5.0	3.4	2.5
Secondary Total, M-gal.	18.0	13.6	8.6
DAFT, M-gal.	0.25	0.25	0.34
Digesters, M-gal.	1.6	1.6	2.2
Total, M-gal.	19.85	15.45	9.14

Power Draw

	Traditional	Improved	W/Captivator
Aeration Process Power	1100 HP	800 HP	380 HP
Volatiles Destroyed, lbs/day	13,000	13,000	26,000
Power from Biogas	300 HP	300 HP	600 HP
Difference	-800 HP	-500 HP	+220 HP

Summary

The Captivator Process ...more into the digester, less into the aeration process

Lowers basic treatment volume by more than 50%

Lower basic treatment equipment by more than 50%

Increase biogas by 100%

Replaces “energy user” with “energy provider”

Thank You

Any Questions?