Effluent Characteristics of Technology Alternatives for Municipal Sewage Treatment[1]
December, 2010

Typical Wastewater Constituent Influent Characteristics (mg/L)	12-50[13]	20-85[13]	0[14]	180-300	180-300	3-7[13]
Treatment Technology (medium & large POTW)	Achievable Effluent Characteristics by the Technology (mg/L)					
	Ammonia nitrogen	Total nitrogen	Nitrate nitrogen	BOD	TSS	Total phosphorus
Non-discharging Alternatives						
Dedicated Land Application	Ref[2]	Ref[2]	Ref[2]	30	30	Ref[2]
Advanced Innovative Treatment Technologies						
Modified Ludzack Ettinger (MLE)	0-2	5-8	3-6 Ref[7]	10-20	10-20	2-6
Bardenpho Process	0-1	3-6	1-7	10-20	10-20	2-6
$A^2/0$	0-1	6-8	1-7	10-20	10-20	1-2 (without metal salt addition)
Oxidation Ditch with Nitrogen Removal	0-1	3-6 (3-5 TN w/mixed liquor recycle)	2-5	10-20	10-20	2-6 (15 to 35% reduction)
Sequencing Batch Reactor (Sanitaire's ICEAS process)	0.5-5	3-5	3-6 (w/anoxic stage & mixer)	<10	<10	0.3-2 (requires metal salt addition)
Post filtration with metal salt addition (after advanced innovative above)	na Ref[3]	na Ref[3]	na Ref[3]	2-5	2-5	0.03-1
Post Denitrification(after advanced innovative above with full nitrification)	0-1	3-5	1-2	10	10	na Ref[4]
Enhanced Treatment Technologies (above Conventional)						
Modified Activated Sludge Plants	<2	20-80 Ref[6]	na Ref[5]	10- 30	10- 30	2.5-6
Seasonal Discharging Alternatives						
Lagoons - Facultative	2.4-10	20-80 Ref[6]	na Ref[5]	20-30	150	2-7
Lagoons - Aerated and Mixed	more effective than facultative	20-80 Ref[6]	na Ref[5]	15	20-60	more effective than facultative
Conventional Alternatives						
Activated Sludge Plants	little to some reduction	20-80 Ref[6]	na Ref[5]	10-50	15-60	2.5-6
Sequencing Batch Reactors (SBR)	5-8	20-80 Ref[6]	na Ref[5]	10	10	1-2
Oxidation Ditch	5-8	20-80 Ref[6]	na Ref[5]	10-30	10-30	2.5-6
Metal Salt Precipitation (incorporated in secondary system)	na Ref[3]	na Ref[3]	na Ref[3]	15	15	0.5-1

1. Effluent characteristics depend on many factors & plant operation. The table assumes favorable influent conditions & high operator management. The values reflect optimal effluent levels for the technology.

2. This is a non d=discharging alternative, therefore nutrient concentrations are not applicable. Agronomic application rates will need to be honored, however there is no surface water discharge.

3. The nitrogen series remain unchanged by metal salt addition. Metal salts are used to remove P.

4. Post denitrification is designed to remove nitrate. Often some phosphoric acid is added to assure that there is enough P to sustain microorganism metabolism.

5. Activated sludge plants are not designed to remove nitrate. There is no reduction. Often there is a slight increase. The increase depends on how much ammonia is converted.

6. The facility is not designed for removal of nitrogen (oxic/anoxic cycles), therefore there is little change through system. The starting total nitrogen is in the 20-80 mg/L range.

7. WEF (1992). Manual of Practice. Design of Wastewater Treatment Plants.

13. Sedlak, R., Phosphorus and Nitrogen Removal from Municipal Wastewater, Principles and Practice, Second Edition (1991)

14. Nitrate is typically zero entering a municipal wastewater treatment facility. Once ammonia is converted, Nitrate is generated and can typically get in the range of 2 to 12 mg/l if no denitrification occurs.