

Powell Water Systems Inc.

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Centennial, Colorado 80015 USA
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<http://www.powellwater.com>
powellwater@powellwater.com



Case Study - Hydro, OK WWTP Installation

Using the patent pending BiO2 PW Inc system

Analysis of Hydro, OK WWTP Effluent for BOD, CBOD and TSS

Date		BOD		TSS	Lab
Permit		20	CBOD	30	Performing
Limits		mg/L		mg/L	Analysis
12/20/2013	Influent	165		171	CAL
	Effluent	7		9	CAL
2/24/2014	Influent	254	223	350	CAL
	Effluent	15	11	17	CAL
6/13/2014	Influent	166	151	158	CAL
	Effluent	14	5	15	CAL
11/13/2014	Influent	226	206	48	CAL
	Effluent	3	2.8	8.5	CAL
5/28/2015	Influent	140	119	332	CAL
	Effluent	3	3	10	CAL

CAL—Colorado Analytical Laboratories, Inc.

Analysis of Hydro, OK WWTP Effluent for Fecal Coliforms

Date	CFU/100 ml	Lab Performing Analysis
Permit Limits	200 CFU/100 ml	
2/26/2014	<10	ETI
5/2/2014	52	ETI
6/3/2014	10	ETI
7/15/2014	<10	ETI
8/12/2014	10	ETI
9/16/2014	<10	ETI
5/12/2015	<10	ETI
6/4/2015	<10	ETI

ETI--Environmental Testing, Inc, of Oklahoma City, OK

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Analysis of Hydro, OK WWTP Effluent for NH₃ and PO₄

Date	Influent Effluent		Temperature	Effluent PO ₄	Lab Performing Analysis
	NH ₃	NH ₃			
10/21/2013		0.11		1.17	CAL
11/4/2013		0.44			CAL
11/20/2013		0.43		0.83	CAL
2/6/2014	28.4	0.58	30°F		AES
3/7/2014	18.0	0.09	41°F		AES
5/23/2014				0.87	CAL
6/13/2014				0.46	CAL
8/7/2014				1.34	CAL
11/13/2014	14.5	0.09			CAL
12/9/2014	17.5	0.4		0.3	AES
5/28/2015				0.52	CAL

CAL—Colorado Analytical Laboratories, Inc.

AES—Anthony's Environmental Services

Hydro has no current permit limits for NH₃ and PO₄

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Icing on Pond—February 6, 2014



Analysis of Samples Taken From Hydro Facility—February 6, 2014

	BOD	TSS	NH₃	Water Temp
Influent			28.4 mg/L	
Effluent	6.3 mg/L	9.0 mg/L	0.28 mg/L	30° F

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Illegal Discharge of Oil Pollutant—April 4, 2014



Influent from City was diverted into empty concrete clarifying tanks, previously used at WWTP. Picture shows pollutant being pumped using a self-priming centrifugal pump from cell into clarifying tanks.



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Oil Pollutant Residue after Solid Separation Process in the EC Building



Before and After Treatment Samples



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The WWTP experienced a second instance of illegal discharge of oil pollutant in April, 2015. In each instance, the combined technologies of BiO₂ Biological Treatment Process and Powell Water Electrocoagulation allowed the City to avoid the high cost of pumping and hauling the pollutant to a Hazardous Waste Facility and stay in compliance with their permit limits. The process is patent pending by BiO₂ PW Inc.

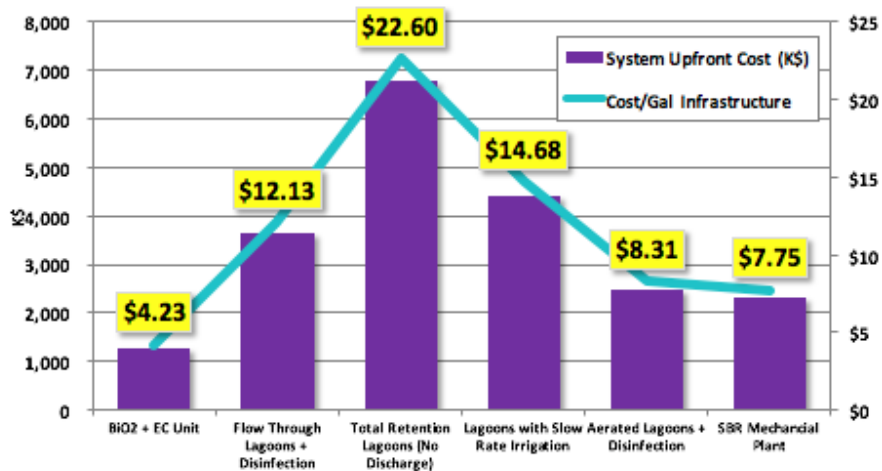
Hydro WWTP CAPEX and OPEX Feasibility Analysis

Feasibility by Third Party Engineering Firm

(based on .3 MGD design flow)

(2011 Pricing)

SYSTEM CAPEX COSTS

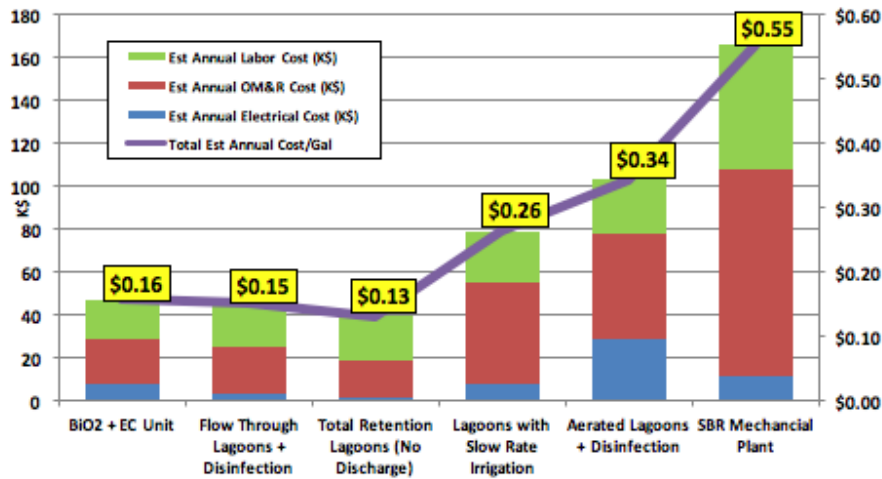


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SYSTEM OPEX COSTS



Hydro, OK WWTP Actual Metered Electrical Usage—2014

Hydro, OK WWTP

Feasibility Study by third party engineering firm evaluating the installation of surface aerators and disinfection on existing lagoon

Component	HP Required	Hours Operated/Day	Days Operated/Year	KWH Req./Year (@ 0.746 KWH/hp)	Estimated Cost/Item (assume \$0.1/KWH)
Four-10 hp surface aerators	40	24	365	261,398	\$26,140
Influent pumping	5.4	5.8	365	8,528	\$853
Chlorination Mixing/Pumping	2	24	365	13,070	\$1,307
Dechlorination Mixing/Pumping	1	0.58	365	6,535	\$654
Estimated OM&R					\$48,741
Estimated Labor					\$25,028
Total Annual KWH				289,531	
Estimated Annual Operational Cost					\$102,723

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**Hydro, OK WWTP**

Actual operating cost associated with BiO₂ PW Inc patent pending Solutions technology

Component	HP Required	Hours Operated/Day	Days Operated/Year	KWH Req./Year (@ 0.746 KWH/hp)	Estimated Cost/Item (assume \$0.1/KWH)
8 tank greenhouse utilizing 8 growth lights @ 430 W		10	365	12,556	\$1,256
Eight-2.84 KWH heaters (22.7 KWH)		10	150	34,050	\$3,405
48 microbubble diffuser units powered by 12 compressors	Twelve 1/3 hp compressors (4 hp)	24	365	26,140	\$2,614
Powell Water EC Technology (50 gpm)— includes all components				76,314	\$7,631
Estimated OM&R					\$21,600
Estimated Labor					\$18,000
Total Annual KWH				149,060	
Estimated Annual Operational Cost>					\$54,506

Hydro WWTP savings: \$48,217/year (140,471 KWH/year)