CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Central Valley Regional Water Quality Control Board

TO: Wendy Wyels
Supervisor
Compliance and Enforcement Section

FROM: Howard Hold, P.G.
Senior Engineering Geologist
WDRs and Title 27 Compliance and Enforcement Unit

Guy Childs, P.G.
Engineering Geologist
WDRs and Title 27 Compliance and Enforcement Unit

DATE: 19 November 2015

SUBJECT: The Morning Star Packing Company, L.P., Summary of Potential Measures and their Estimated Costs

The Morning Star Packing Company, L.P. processing facility is regulated by Waste Discharge Requirements (WDRs) Order R5-2013-0144. Per the WDRs, Morning Star Packing, L.P. (Discharger) is required to operate its facility, dispose, and treat waste in the manner adopted by the Water Board. The Discharger expanded their facility without approval by the Regional Water Board. Specifically, they expanded the Cooling and Settling Ponds, as well as removed land application areas in the process.

This memorandum provides a summary of measures that could have been implemented by the Discharger in order to meet the requirements in the WDRs, rather than the unpermitted expansion of the Cooling and Settling Ponds. The proposed factory enhancements include the installation of dissolved air floatation (DAF) units, cooling tower, mechanical aerators, and rotary screens.

Cooling Pond Expansion - Potential Measures

Days of Operation

The Cooling pond was expanded prior to the 2015 processing season, and was used during the 92 days of processing. Therefore the number of days used in this memorandum is 92 days, the extent of the 2015 processing season. It should be noted however, that the Cooling Pond is not emptied after the processing season ends, and therefore wastewater continues to seep into groundwater. Board staff chose not to extend the days of violation because additional waste was not discharged to the Cooling Pond after the processing season ended.

Dissolved Air Flotation Unit

Morning Star Packing is discharging organic waste into the cooling pond, in violation of the WDRs. A DAF unit could be used to treat wastewater, which has high levels of suspended solids and oils that are found at food processing facilities like Morning Star Packing. A DAF unit is designed to introduce pressurized air into a flotation tank. As wastewater passes through the tank, the injected air adheres to the organic matter. Consequently the organic material floats to the surface where a skimmer removes the solids. The removal of solids greatly reduces the BOD levels in the wastewater which is discharged into a wastewater pond. The Discharger could have used DAF units to separate the organics from the wastewater which would prevent organics from entering the Cooling Pond.

Ecologix Environmental Systems (http://www.ecologixsystems.com/system-v-series-daf.php), who designs and builds wastewater treatment systems, recommended a minimum of one DAF unit for the assumptions Board staff provided. With these assumptions, the estimated cost to purchase and install one DAF unit with controller would be approximately **$660,000**. This cost includes the $200,000 control unit. Because Total Suspended Solids data and actual flow is not known, this is considered a conservative estimate.

Operational Cost Assumptions:

123 HP (HP rating of one DAF unit) converts to 91.7 kilowatts x 92 days (days of operation of the expanded cooling pond) x 24 hours of operation/day = 202,473 kilowatt hours x $0.1049 ([1]per kilowatt hour) = **$21,239.**

Cooling Tower

Cooling towers are used to remove process heat from the system. Process water is circulated through coils as air is blown over the top, which reduces the temperature. According to a 13 November 2015 cost estimate from Cooling Tower Systems, Inc. (see attachment), the estimated cost to purchase and install a 40 HP Cooling Tower is **$81,930**. However, because the flow is not known, Board staff could not accurately determine the number of towers needed for their process. Therefore, only one tower was estimated.

Operational Cost Assumptions:

40 HP (HP of Cooling Tower) converts to 29.82 kilowatts x 92 days (days of operation of expanded cooling pond) x 24 hours of operation/day = 65,842 kilowatt hours x $0.1049 (per kiolowatt hour) = **$6,907.**

Aerators

Aerators are used to increase oxygen levels in ponds and ensure that the dissolved oxygen (DO) concentrations are above 1 mg/L, which is the required limit in the WDRs. From 6 August 2015 through 12 October 2015, DO concentrations were consistently reported by the Discharger at less than 1 mg/L in the Cooling Pond. No aerators were present in the Cooling Pond. In order to increase oxygen levels in the pond, the Discharger could have installed aerators in the Cooling Pond.

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[1] Sacramento County Industrial Electricity Rates: http://www.electricitylocal.com/states/california/sacramento/

Board staff reviewed the ConAgra Grocery Products Processing Facility file, which is regulated by WDRs R5-2002-0098. According to the WDRs, an average of 4.4 million gallons per day of tomato processing wastewater is generated that is discharged into a 10 acre (185 acre-foot) aeration pond. According to the ConAgra, 14 mechanical aerators are used to maintain DO concentrations above 1 mg/L and control odors. Board staff assumes that in the permitted 60 acre Cooling Pond at least 20 aerators would be needed (approximately one aerator per every three acres of pond surface area). Therefore, the costs to purchase and install 20 mechanical aerations in the Cooling Pond with a 20 horsepower rating would be **$307,830.**

Source of Costs: http://www.allcostdata.info/detail.html/153901005/20HP,1200RPM-Mech-Surf-Aerator-With-DI-Deflector--Carbon-Steel-Core

Operational Cost Assumptions:

400 HP (20 aerators x 20 HP each) converts to 298 kilowatts x 99 days (days of operation of expanded cooling pond) x 12 hours of operation per day (assumes half of the aerators are operating at one time) = 354,024 kilowatt hours x $0.1049 (per kilowatt hour) = **$37,137.**

Settling Pond Expansion – Potential Measures

Days of Operation

Board staff made a conservative estimate that the Settling Pond was expanded after the 2011 processing season. A review of the monitoring reports shows that the 2012 processing season was 81 days (24 July through 12 October 2012), the 2013 processing season was 83 days (12 July through 2 October 2013), the 2014 processing season was 92 days (16 July through 15 October 2014, and the 2015 processing season was 92 days (1 July 2015 through 30 September 2015). Board staff assumed that the liquid in the settling pond was emptied on the last day of the processing season (although the solids remained for months afterward). Therefore, the cumulative days that the expanded Settling Pond was used during the 2012 through 2015 processing seasons is 348 days, which is used this memorandum.

Dissolved Air Flotation System

Ecologix Environmental Systems, (http://www.ecologixsystems.com/system-v-series-daf.php) recommended a minimum of two DAF units would be needed based on Board staff's assumptions. Those assumptions were a high volume (4,000 gallons/minute[2]) and a high BOD. With these assumptions, the estimated cost to purchase and install two DAF tanks (at $660,000 each, including the two control units) would be **$1,320,000**. Because Total Suspended Solids data and the actual flow is not known at this time, this is considered a conservative estimate.

246 HP (HP rating of two DAF units) converts to 183.4 kilowatts x 348 days (total days of operation of expanded settling pond for 2012 through 2015 processing seasons) x 24 hours of operation = 1,531,756 kilowatt hours x $0.1049 (per kilowatt hour) = **$160,331**.

Rotary Screen

A Rotary Screen could have been installed to enhance the removal of solid materials from the waste stream that is discharged to the Settling Pond. Based on Board staff's conversation with

[2] Maximum pump rate of supply well.

Franklin Miller (www.franklinmiller.com) who sells the Screenmaster RT rotary drum screen, at a minimum one screen could be installed at the tomato off loading and wash area located near the Settling Pond. The cost to purchase the largest unit (RT2000/30) would be approximately $100,000. Delivery and Installation would be assumed at approximately 20 percent of the purchase price for a total cost of **$120,000**.

Operational Cost:

30HP (HP rating of rotary screen) converts to 22.3 kilowatts x 348 days (total days of operation of expanded settling pond for 2012 through 2015 processing seasons) x 24 hours of operation = 186,834 kilowatt hours x $0.1049 (per kilowatt hour) = **$19,598**.

Mechanical Aerators

From 6 August 2015 through 29 September 2015 (when the pond was emptied), DO concentrations were consistently reported at less than 1 mg/L in the Settling Pond. Currently, one 5 HP mechanical aerator is present in the pond. In order to increase oxygen levels in the pond, the Discharger could have enhanced the oxygen levels in the Settling Pond by installing additional aerators in the pond.

Board staff has determined that additional aeration is necessary to maintain a DO concentration in the Settling Pond above 1 mg/L. Therefore, it is assumed that an additional two aerators would be needed to meet the DO requirements in the WDRs. The costs to purchase and install two mechanical aerations in the Settling Pond with a 10 horsepower rating would be $22,990.

Source of costs: http://www.allcostdata.info/detail.html/153901003/10HP,1800RPM-Mech-Surf-Aerator-With-DI-Deflector--Carbon-Steel-Core

20 HP (two aerators x 10 HP each) converts to 14.9 kilowatts x 348 days (days of operation of the expanded cooling pond) x 24 hours of operation = 124,444 kilowatt hours x $0.1049 (per kilowatt hour) = **$13,054**.

Conclusions

For compliance with the existing WDRs, Morningstar Packing could have installed the equipment outlined above, without expanding either pond or enlarging the land application area. The total estimated cost would be as follows:

Estimated Costs of Potential Equipment		
Equipment	**Purchase/Installation Costs**	**Annual Operational Costs**
Cooling Pond		
One DAF Unit	$660,000	$21,239
One Cooling Tower	$81,930	$6,907
Twenty Aerators	$307,830	$37,137
Settling Pond		
Two DAF Units	$1,320,000	$160,331
One Rotary Screen	$120,000	$19,598
Two Aerators	$22,990	$13,054

Cooling Tower Systems, Inc.
3170 Mercer University Drive, Macon, GA 31204
Phone: 478-755-1905
Fax: 478-755-8304
info@coolingtowersystems.com
www.coolingtowersystems.com

November 13, 2015

Company: Regional Water Board
Location: Rancho Cordova, CA 95670
Attn: Alejandra Serratos
E-mail: aserratos@waterboards.ca.gov
Phone: 916-464-4634

QUOTE NO. 15-1113-01LL

Per your request, we are pleased to quote below our FRP (Fiberglass Reinforced Polyester) counter flow induced draft cooling tower, cooling tower replacement parts, water pumps, and/or cooling tower accessories to meet and exceed your thermal performance.

PRICE QUOTATION
VALID FOR SIXTY (60) DAYS ONLY

PRODUCT	TOTAL
Design Condition: 120/100/72 @ 4000 GPM	
Model T-3250 Cooling Tower 40HP 220/440V/3/60Hz Fan Motor & V-Belt Speed Reducer OSHA Rated Ladder	$81,930.00

Notes:

1. Delivery Availability: 100-140 days after receipt of purchase order
2. Payment term is 50% down when placing purchase orders, invoice balance 2% 10 days, net 30 after delivery.
3. The above cost includes all associated freight charges and complete field assembly by CTS factory personnel at your Colusa County job site facility.
4. If factory representative is required or desired for cooling tower start up purposes, the approximate cost will be $400/day to include travel, transportation, food and lodging. Is this service is going to be required, the sales office will need to be notified for a formalized quotation a minimum of 3 weeks before startup date.
5. The parts listed below are suggested to be used in your maintenance program. These replacement parts are considered the only parts that would put the tower out of service. These are discounted prices and can only be used with the purchase of this tower.
   a. Fan Motor 40HP — $2,838.00/Each
   b. V-Belt Speed Reducer — $5,458.00/Each
   c. V-Belts — $506.00/Set
   d. Sprinkler Head — $721.00/Each
6. Drawings, specifications and warranty attached.

Thank you for the opportunity to quote you on your equipment needs. We look forward to assisting you as we continue to provide the best customer service and manufactured parts available. If I can be of any further assistance or if you need additional information, please feel free to contact me at your convenience.

Best regards,

Lissette Lopez
Office Manager

Childs, Guy@Waterboards

From: Hold, Howard@Waterboards
Sent: Thursday, November 19, 2015 11:49 AM
To: Horner, Gerald@Waterboards
Cc: Wyels, Wendy@Waterboards; Childs, Guy@Waterboards
Subject: RE: Updated info for economic benefit for Morning Star

Importance: High

Gerry, there has been a revision in the Days of violation. This will alter the calculations.

- For the Cooling Pond the days of violation should be **92 days , not 91 days**. Also, the duration of the aerator operation should change from **98 days to 99 days**.

- For the Settling Pond, the days of violation should be **348 days, not 344 days.**

Thank you for your patience. Howard

From: Horner, Gerald@Waterboards
Sent: Thursday, November 19, 2015 10:02 AM
To: Hold, Howard@Waterboards
Subject: RE: Updated info for economic benefit for Morning Star

Sounds good. Thank you.

From: Hold, Howard@Waterboards
Sent: Thursday, November 19, 2015 8:33 AM
To: Horner, Gerald@Waterboards
Cc: Childs, Guy@Waterboards; wendy.wyels@waterboard.ca.gov
Subject: RE: Updated info for economic benefit for Morning Star

Gerry, Let me answer your questions.

1. What should I use as a cost for filing an amended RWD?

   I asked my staff for help with this cost. They have a revised ROWD cost from the City of Ione, which cost $115,000.

2. For the cooling pond aerators operation time in given as 98 days but in the table 2015 operating days are 91.

   For the Aerators, they would need to operate until the dissolved oxygen levels in the pond reached a value greater than 1. The monitoring reports show that it took 7 days after the processing season ended for the dissolved oxygen level in the pond to be in compliance with the WDRs

3. How is a maintenance worker dedicated to the 200 acres of cropland, and wouldn't this be seasonal? (91 days).

   From our meeting with Morningstar they stated that for each field the Land Application areas are harvested three times a year. So they would need a worker for the year.

4. I'm going to use Sacramento's reported average rate of 11.24 cents/kWh. Most big users are able to negotiate much lower rates for off peak use. Any objections? I could use state average of 10.49 cents. I need a justification to use the Sacramento rate. http://www.electricitylocal.com/states/california/sacramento/

   It's a 24/7 operation so they wouldn't be able to cycle their power for lower rates.

Let me know if you need more. Thank you Howard

From: Horner, Gerald@Waterboards
Sent: Thursday, November 19, 2015 5:45 AM
To: Hold, Howard@Waterboards
Cc: Childs, Guy@Waterboards; wendy.wyels@waterboard.ca.gov
Subject: RE: Updated info for economic benefit for Morning Star

Howard, I have a few questions on your cost data sheet. Great job by the way.

1. What should I use as a cost for filing an amended RWD?
2. For the cooling pond aerators operation time in given as 98 days but in the table 2015 operating days are 91.
3. How is a maintenance worker dedicated to the 200 acres of cropland, and wouldn't this be seasonal? (91 days)
4. I'm going to use Sacramento's reported average rate of 11.24 cents/kWh. Most big users are able to negotiate much lower rates for off peak use. Any objections? I could use state average of 10.49 cents. I need a justification to use the Sacramento rate. http://www.electricitylocal.com/states/california/sacramento/

From: Wyels, Wendy@Waterboards
Sent: Wednesday, November 18, 2015 4:13 PM
To: Horner, Gerald@Waterboards; Knight, Nickolaus@Waterboards; Boyers, David@Waterboards
Cc: Hold, Howard@Waterboards; Childs, Guy@Waterboards
Subject: Updated info for economic benefit for Morning Star

Hi Gerald,
We've put together the attached table to give you as much information possible to determine the avoided/delayed benefit of noncompliance. We broke the items into those needed for the Settling Pond vs those needed for the Cooling Pond and gave you the date at which noncompliance started for each. We also added a few more items (ie, planting the cropland and maintaining the cropland).

Please talk to Howard tonight or tomorrow if you've got any questions. If at all possible, we'd like the updated BEN numbers tomorrow afternoon.

Thanks for your help

Wendy

Childs, Guy@Waterboards

From: Okamoto, Mayumi@Waterboards
Sent: Friday, December 18, 2015 9:52 AM
To: Horner, Gerald@Waterboards
Cc: Wyels, Wendy@Waterboards; Hold, Howard@Waterboards; Childs, Guy@Waterboards; Knight, Nickolaus@Waterboards
Subject: AMENDED BEN For Cooling Pond and Settling Pond
Attachments: AMENDED Dec19 Amended economic benefit expanded information - MeO_gjc.xlsx

Importance: High

Jerry,
Please see the attached Amended Spreadsheet with the BEN inputs. Please re-run BEN for both the Cooling Pond and Settling Pond using these inputs. Inputs for dates should remain the same as the 11/19 version. I'd like these before you leave for vacation.

Please let me know if you have questions.

Thanks.

Mayumi E. Okamoto, Attorney III
Office of Enforcement
State Water Resources Control Board
1001 I Street, 16th Floor
Sacramento, California 95814
Direct: (916) 341-5674
Fax: (916) 341-5284

Compliance Action	Non-Compliance Date	Notes
Cooling Pond		The cooling pond was expanded in early 2015.
File amended RWD	10/1/2014	(should have submitted RWD at least 9 months prior to expansion)
install 1 DAF unit	7/1/2015	($460,000 per unit) + ($200,000 control unit) = $660,000 http://www.ecologixsystems.com/system-v-series-daf.php
electricity for DAF unit	7/1/2015	Convert 123 HP to kilowatt = **91.7** Kilowatts x 24 hours perday x **92** days of operation = **202,474** kilowatts hours x **$0.1049** = **$21,239**
install coooling tower	7/1/2015	Cooling tower cost is $81,930. Includes all associated freight charges and complete field assembly by CTS factory personnel at the Colusa County job site facility.
electricity for cooling tower	7/1/2015	40 HP converts to 29.82 kilowatts = 29.82 kilowatts x **92** days x 24 hours of operation = **65,843** kilowatt hours x **$0.1049** = **$6,907**
install 20 aerators	7/1/2015	**$307,830** for 20 aerators, 20 HP each
electricity for 20 aerators	7/1/2015	20 Aerators x 20 HP = 400 hp = {298 kilowatts x 12 hours (assumes 1/2 operating at one time) x 99 days (Last DO value below 1)*** }= 354,024 kilowatt hours x **$0.1049** = **$37,137**
Settling Pond***		Settling Pond was expanded sometime in 2011; we assume it was the fall of 2011
file amended RWD	1/1/2011	
install 2 DAF units	6/24/2012	2 x ($460,000 per unit) +2 X($200,000 control unit) = $1,320,000 http://www.ecologixsystems.com/system-v-series-daf.php
electricity for DAF units	6/24/2012	Convert 2X 123 HP to kilowatt = 183 Kilowatts x 24 hours perday x **348** days of operation = **1,528,416** kilowatts/hours x **$0.1049 =**
install rotary screen	6/24/2012	Cost is $120,000 for one Rotoscreen (ScreenMaster RT)
electricity for rotary screen	6/24/2012	[30 HP converts to Kilowatts] {(22.37 kilowatts)] x (24 hours per day operating) x **(348** days of operation) = **186,834** kilowatts/hour hours x **$0.1049 = $19,598**
purchase and install 2 aerators	6/24/2012	$22,990 for two 10 HP aerators
electricity for 2 aerators	6/24/2012	10 HP x 2 = 20 hp = 14.9 kilowatts x (24 hours per day) x (**348** days of operation)= **124,445** kilowatt hours x **$0.1049 = $13,054**

The compliance date for all actions is 18 February 2016 (date of Board meeting)
The penalty payment date if 18 Feb 2016
**per morningstar 14 Oct 2015 daily report
** *for the settling pond operation dates see table below

Processing Year	Date Ra	Days of processing	Days of Processing
2012	July - 12	~~80~~	**81**
2013	July - 2 (	~~82~~	**83**
2014	July - 15	~~91~~	**92**
2015	uly - 30 S	~~91~~	**92**
		~~344~~	**348**

Cooling Tower Systems, Inc.
3170 Mercer University Drive, Macon, GA 31204
Phone: 478-755-1905
Fax: 478-755-8304
info@coolingtowersystems.com
www.coolingtowersystems.com

November 13, 2015

Company: Regional Water Board
Location: Rancho Cordova, CA 95670
Attn: Alejandra Serratos
E-mail: aserratos@waterboards.ca.gov
Phone: 916-464-4634

QUOTE NO. 15-1113-01LL

Per your request, we are pleased to quote below our FRP (Fiberglass Reinforced Polyester) counter flow induced draft cooling tower, cooling tower replacement parts, water pumps, and/or cooling tower accessories to meet and exceed your thermal performance.

PRICE QUOTATION
VALID FOR SIXTY (60) DAYS ONLY

PRODUCT	TOTAL
Design Condition: 120/100/72 @ 4000 GPM	
Model T-3250 Cooling Tower 40HP 220/440V/3/60Hz Fan Motor & V-Belt Speed Reducer OSHA Rated Ladder	$81,930.00

Notes:

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Thank you for the opportunity to quote you on your equipment needs. We look forward to assisting you as we continue to provide the best customer service and manufactured parts available. If I can be of any further assistance or if you need additional information, please feel free to contact me at your convenience.

Best regards,

Lissette L

Lissette Lopez
Office Manager

Browse Section: High Speed Mechanical Surface Aerator Including

High Speed Mechanical Surface Aerator Including

10HP,1800RPM Mech Surf Aerator With DI Deflector & Carbon Steel Core

Item	Rate
Material	10,307.08 / EA
Laborers, (Semi-Skilled) Foreman ($27.02/hour for 4.93 hours)	133.28 / EA
Laborers, (Semi-Skilled) ($25.93/hour for 19.73 hours)	511.64 / EA
Equip. Operators, Medium ($32.96/hour for 4.93 hours)	162.60 / EA
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM ($41.87/hour for 9.65 hours)	404.22 / EA
Other	0.00 / EA
Total	**11,518.82 / EA**

Browse Section: High Speed Mechanical Surface Aerator Including

High Speed Mechanical Surface Aerator Including

20HP,1200RPM Mech Surf Aerator With DI Deflector & Carbon Steel Core

Item	Rate
Material	14,216.66 / EA
Laborers, (Semi-Skilled) Foreman ($27.02/hour for 4.93 hours)	133.28 / EA
Laborers, (Semi-Skilled) ($25.93/hour for 19.73 hours)	511.64 / EA
Equip. Operators, Medium ($32.96/hour for 4.93 hours)	162.60 / EA
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM ($41.87/hour for 9.65 hours)	404.22 / EA
Other	0.00 / EA
Total	**15,428.40 / EA**

end of record

NEW VLT-SERIES - Dissolved Air Flotation System

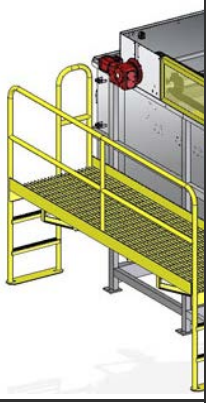
Dissolved Air Floatation is widely used for separating solids, fats, oil, and grease from a waste stream. In the process, pressurized water is saturated with dissolved air and is discharged into a flotation vessel. The microscopic air bubbles attach to solids and float them to the surface, forming a sludge blanket. A scraping assembly skims the sludge off the surface of the water and into a sump. From the sump, sludge is pumped to dewatering equipment. The treated water flows from the DAF vessel for discharge or on to other treatment processes. Click the image to the right to view a video of a VLT-Series Dissolved Air Flotation system in operation.

Request a Quote Download Brochure

Why should I select a VLT-Series DAF?

The VLT-Series DAF system is engineered to address the inefficiencies common to other system designs. We incorporated a V-shaped flotation cell with a sludge auger so any solids that resist flotation can be automatically removed from the base of the vessel. The skimmer assembly is made of materials that don't scale, foul, or corrode. The adjustable weir and scraper assembly assures that there are never any dead zones or carry overs in the sludge skimming zone. With the addition of the new Lamella Tubes the effective surface area of the DAF has increased substantially, doubling the flow rate for an small footprint, with clearer effluent water. As a result, the VLT-Series can achieve up to 99% removal of TSS, FOG and 75% of BOD. Dissolved Air Flotation systems pair well with flocculation tubes, chemical reaction tanks, and chemical feed systems.

VLT Series DAF available models

VLT 4 Series								
Model	**Flow Rate US gpm**	**Flow Rate m^3/h**	**Dimensions (Ft) (L x W x H)**	**Dimensions (m) (L x W x H)**	**Surface Area (Ft^2)**	**Surface Area (m^2)**	**Power (hp)**	**De**
VLT-405	50	12	10' 3" x 4' 4" x 9'	3 x 1.3 x 2.7	86	8	8.0	
VLT-410	150	34	12' 7" x 5' 5" x 9'	4 x 1.6 x 2.7	235	22	11.0	
VLT-415	275	60	16' 9" x 5' 5" x 9'	5 x 1.6 x 2.7	400	40	21.0	
VLT-420	400	90	21' 9" x 5' 5" x 9'	6.6 x 1.6 x 2.7	600	60	21.0	
VLT-425	500	115	27' x 5' x 9'	8.1 x 1.6 x 2.7	800	75	31.0	

VLT 7 Series								
Model	**Flow Rate US gpm**	**Flow Rate m^3/h**	**Dimensions (Ft) (L x W x H)**	**Dimensions (m) (L x W x H)**	**Surface Area (Ft^2)**	**Surface Area (m^2)**	**Power (hp)**	
VLT-715	500	113	16' 9" x 8' 5" x 10' 5"	5 x 2.6 x 3.1	715	66	31.0	
VLT-720	700	160	21' 9" x 8' 5" x 10' 5"	6.7 x 2.6 x 3.1	1060	100	31.0	
VLT-725	900	200	26' 9" x 8' 5" x 10' 5"	8.1 x 2.6 x 3.1	1400	130	31.5	
VLT-730	1100	250	31' 9" x 8' 5" x 10' 5"	9.7 x 2.6 x 3.1	1750	160	61.5	

VLT 10 Series								
Model	Flow Rate US gpm	Flow Rate m^3/h	Dimensions (Ft) (L x W x H)	Dimensions (m) (L x W x H)	Surface Area (Ft^2)	Surface Area (m^2)	Power (hp)	Design
VLT-1025	1300	295	27' 9" X 11' 5" x 11'	8.4 x 3.5 x 3.3	1900	175	62.5	
VLT-1030	1600	363	32' 9" X 11' 5" x 11'	10 x 3.5 x 3.3	2400	220	92.5	
VLT-1035	1900	430	37' 9" X 11' 5" x 11'	11.5 x 3.5 x 3.3	2900	270	93.0	
VLT-1040	2200	500	42' 9" X 11' 5" x 11'	13 x 3.5 x 3.3	3395	315	93.5	
VLT-1045	2500	568	47' 9" X 11' 5" x 11'	14.5 x 3.5 x 3.3	3890	360	123.5	
VLT-1050	2800	635	52' 9" X 11' 5" x 11'	16 x 3.5 x 3.3	4385	400	123.5	

Meat Processing Plant

This system includes coarse screening, chemical reaction tanks, DAF unit, and screenings/sludge dewatering. Designed to remove TSS, FOG, and BOD.

Dairy Plant

This process includes high flow, gravity fed chemical reaction tanks, DAF unit, and chemical feed systems. Designed to reduce TSS, FOG, and BOD.

Specifications for Dissolved Air Flotation System

Download Specifications

Ecologix Environmental Systems, LLC shall supply the VLT Series Dissolved Air Flotation (DAF) system that shall include influent, effluent, and drain connections, floatation tank, contact chamber, float removal system, settled solids return system, lamella tubes, complete recirculation system including whitewater pump, saturation tank followed by a secondary weir for finer bubble separation of large bubbles from small bubbles and local PLC based control panel. As more specifically outlined below:

a) Influent Wastewater: Influent is induced with chemistry in order to precipitate suspended solids, fat oil & grease and other impurities from the water prior to the physical separation with dissolved air flotation.
The DAF shall incorporate one of the following methodologies to inject and mix chemicals:

i. Flocculation Tubes: The DAF shall incorporate flocculation tubes made of Schedule 80 PVC with injection ports for coagulants, pH adjustment and polymers, along with static mixers. The wastewater shall enter the flocculation tubes through a flanged connector and exit into the contact tank through another flanged connector at the header.
ii. Chemical Reaction Tanks: For greater control over the precipitation of impurities, chemical reaction tanks are recommended. The reaction tanks shall have mounted mixers with VFDs (Variable Frequency Drives) and means to accept chemistry from various chemical feed pumps into the tanks. The reaction tanks shall be placed prior to the DAF. The influent wastewater shall first pass through the reaction tanks and then exit into the contact chamber through a flange connector at the header.

b) Contact Chamber: The influent wastewater shall enter the DAF unit through a flanged influent header into the contact chamber. Simultaneously, the recycle (whitewater) stream shall be mixed with the influent wastewater through a tangential pipe that is connected into the header, creating vortex. The vortex effect results in 100% contact between the air bubbles in the whitewater and the dirty influent water. As the water enters into the contact chamber it shall first encounter an internal weir acting as a secondary coarse bubble separator which provides even distribution and mixing of the process flow across the width of the unit, without any turbulence. The contact chamber has a drain port for removal of heavy solids that may settle in the chamber.

c) Flotation Tank: The unit consists of a rectangular flotation tank constructed of 304 stainless steel plate reinforced with

304 stainless steel tubular vertical wall structural supports.

i. The vessel shall be supported on a stainless steel base consisting of vertical and horizontal beams across the width and length of the unit.
ii. The vessel shall be constructed to allow for easy cleaning around and under the unit. The unit shall be designed for above-ground positioning on a suitable concrete pad or steel frame and shall be constructed for indoor or outdoor conditions.

d) Lamella Tubes in Flotation Chamber: To increase efficiency and maintain smaller footprint, the Flotation Chamber shall be filled with Lamella Tubes, whose function is to increase the projected surface area and improve the separation efficiency of the solids from the clear water. The Lamella Tubes shall be made of Polypropylene material with 60° angular slant toward the co-current water flow. The lamella tubes shall have chevron shape to prevent clogging and 2" spacing between each lamella.

e) Float Removal System: The unit shall be equipped with a chain and flight skimmers to remove top floats, driven by a low speed VFD (Variable Frequency Drive), gear reducer with motor assembly. The float material shall be removed in a co-current direction. This design involves moving the float bed on the surface down the length of the unit to a separate compartment in the direction of flow and allows for longer float residence time prior to removal, resulting in drier float material.

i. The top skimmer system consists of non-metallic glass reinforced nylon chain with a maximum recommended working load of 1740 lbs., or average ultimate strength of 2800 lbs. in a double pitch roller chain. The skimmer blades are spaced approximately every 6 ft. along the chain length. The chain system operates on single duty, non-metallic UHMW sprockets mounted on stainless steel shafts turning in adjustable bearing supports. The system is driven by a gear drive with TEFC coupled to the keyed drive shaft. Drive speed shall be controlled by a VFD (in the control panel) which shall be equipped with a shaft power monitor to protect the equipment in case of overload. Adjustable timer controls or PLC controls (in optional control panel) provide for intermittent skimmer operation which allows for flexibility in the removal of float material from the unit.
ii. On the effluent end, the skimmer pulls the collected surface material (float) up an inclined beach plate and into an internal float hopper. The beach is sloped to allow for efficient removal of float material by the skimmer wiper. The internal float hopper is sized to allow intermediate storage of the material prior to discharge through a flanged pipe for pumping to storage for dewatering or transport.

f) Settled Solids Removal System: Full-length sloped side walls channel shall concentrate settable material to a trough in the bottom of the tank for removal by an auger system pulling the material towards the influent end of the unit (counter-current). The counter-current design removes settled material quickly from the unit at the opposite end from the treated water discharge. The material is discharged through a flanged pipe located in the influent end of the unit base. The auger system consists of a 4" or 6" diameter, with a 4" or 6" pitch. The 304 stainless steel auger shall be located at the bottom of the V-shaped side walls. The auger shall extend 95% to 100% of the full length of the DAF. The system shall be driven by a heavy duty gear drive assembly connected to a 0.33HP/460V/TEFC motor with a shear coupling for overload protection. Adjustable timer controls (in optional control panel) provide for intermittent auger operation which allows for flexibility in the removal of bottom material from the unit.

g) Effluent Discharge: At the effluent the clear water shall flow under the sludge compartment, over a couple of weirs and into a clear well compartment from where it shall be discharged through a flanged pipe. The system shall have two weirs on opposite sides of the DAF to promote symmetric flow across the unit.

h) Recirculation (Whitewater) System: The recirculation system is designed to saturate, under pressure, a clarified effluent stream with air to create a dissolved air solution or whitewater. When the whitewater stream is introduced into the contact chamber of the DAF unit, the fine, micro and nano-bubbles are then released to attach themselves to the flocculated suspended solids, causing it to rise to the surface of the water within the flotation tank for further removal as sludge.

i. Clarified wastewater from the effluent discharge is recycled through the unit by a centrifugal DAF pump designed to operate at pressures in the range of 80-120 psi. The pump features a 316 stainless steel casing and impeller, stainless steel shaft, and a premium efficiency 460 V/3 ph/60 Hz/TEFC motor.

ii. Air is supplied into the recycle stream via a suction port on the whitewater pump intake, drawing in either ambient or compressed air and forcing it into solution with the recycle stream under pressure from the pump. Air flow into the pump is regulated by an air rotameter with a needle valve. All plastic recirculation piping is Sch. 80 PVC.
iii. The recycle stream is routed through a Saturation Tank that provides additional hydraulic retention time under pressure and allows the separation and removal of large, undissolved air bubbles. The Saturation Tank shall be a vertical section of stainless steel pipe in the recycle piping system that is equipped with a bottom valve for draining and servicing. Liquid level in the Saturation Tank shall automatically be maintained by an air release valve with an in-line equalizer.
iv. Discharge pressure from the recycle pump and the Saturation Tank shall be channeled through a tangential pipe and into the influent pipe causing vortex to take effect to maximize the contact of the air bubbles with the incoming suspended solids prior to entering the contact chamber.
v. A secondary bubble separation chamber shall be positioned immediately after the influent pipe and prior to the contact chamber for further separation of large bubble, to ensure maximum consistency of small air bubble size and to eliminate any possible turbulence within the contact chamber.
vi. A mid-tank whitewater injection system shall be optionally provided when the length of the DAF exceeds certain dimensions and when the suspended solids are above certain range. A liquid filled pressure gauge is provided for monitoring recycle pressurization performance.

i) Control Panel: The controls shall be housed in a minimum of NEMA 4/12 enclosure unless environmental conditions, such as outdoor placement or explosion proof require otherwise.

i. The DAF shall be PLC controlled with a color touchscreen interface including graphics, text, and the ability for the operator to change the required parameters for maximum efficiently.
ii. The control panel shall be designed to protect all field equipment and allow for individual equipment electrical isolation.
iii. The control panel shall include the ability to automatically send out alarms to the required personnel such as maintenance. It shall also have the ability to send out reports to the required personnel such as production or management.
iv. The PLC shall have the ability to simultaneously communicate with the customer SCADA system, regardless of the standard type and protocol that may be used by the client.

j) Paint and Coatings: All motors, pumps, drives, instruments, control panels, and valves are shipped with the manufacturer's standard coatings.

Quick Links

Pre-Treatment
Primary Treatment
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Tertiary Treatment
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Dissolved Air Flotation
Settling Clarifiers

Bio-Clear
IBR
ITS
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Bag Filters

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Zeo-Clear

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About Ecologix

Ecologix Environmental Systems is a world-class manufacturer and integrator of wastewater treatment equipment for the oil & gas, food, manufacturing, and automotive industries. Learn more About Ecologix.

Screenmaster® RT

The Screenmaster RT, internally fed drum screen, employs a rotating drum to provide effective fine screening of a variety of materials with a simple and reliable design. It is fully constructed in corrosion resistant T304 or T316 Stainless Steel and employs a cylindrical screen constructed with perforated metal, wedge wire or filter cloth along with a weir system. As the material is

fed into the unit's inlet, it is distributed along the internal screen surfaces. As the drum rotates, the weir moves the solids along the screen length. The liquids are discharged from the unit's bottom. The solids are conveyed to the unit discharge flange. The RT is provided in a choice of models with up to 60″ diameter drums up to 156 inches (4m) in length.

The RT is provided with a choice of screen openings from 500 x 500 micron (filter cloth) up to 6 mm perforations. The screen segments are removable from the outside of the unit after simple removal of the exterior stainless steel panel enclosures. The unit is provided with both internal and external high pressure nozzles to keep the screen clear. The wash system employs 35 gpm of water at 60 psi. Each unit is typically supplied with a PLC-based control system housed in a NEMA 4X enclosure. The Screenmaster RT is perfect for a wide variety of applications including; Wastewater Treatment, Membrane, Filtration, Fat, Pulp & Paper, Slaughter House, and Offal.

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Specifications

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DIMENSIONS

RT MODEL NO.	DRUM DIAMETER	DRUM LENGTH	INLET	OUTLET
RT600/6	24" (600 mm)	24" (600 mm))	4" (100 mm)	8" (200 mm)
RT600/10	24" (600 mm)	39" (1000 mm)	4" (100 mm)	8" (200 mm)
RT600/15	24" (600 mm)	59" (1500 mm)	4" (100 mm)	8" (200 mm)
RT900/10	35" (900 mm)	39" (1000 mm))	6" (150 mm)	10" (250 mm)
RT900/15	35" (900 mm)	59" (1500 mm)	6" (150 mm)	10" (250 mm)
RT900/20	35" (900 mm)	79" (2000 mm)	6" (150 mm)	10" (250 mm)
RT900/25	35" (900 mm)	98" (2500 mm)	6" (150 mm)	12" (300 mm)
RT1200/15	47" (1200 mm)	59" (1500 mm)	8" (200 mm)	12" (300 mm)
RT1200/20	47" (1200 mm)	79" (2000 mm)	8" (200 mm)	12" (300 mm)
RT1200/25	47" (1200 mm)	98" (2500 mm)	8" (200 mm)	14" (350 mm)
RT1500/15	59" (1500 mm)	59" (1500 mm)	10" (250 mm)	14" (350 mm)
RT1500/20	59" (1500 mm)	79" (2000 mm)	10" (250 mm)	14" (350 mm)
RT1500/25	59" (1500 mm)	98" (2500 mm)	10" (250 mm)	14" (350 mm)
RT1500/30	59" (1500 mm)	118" (3000 mm)	10" (250 mm)	14" (350 mm)
RT2000/30	79" (2000 mm)	118" (3000 mm)	12" (300 mm)	16" (400 mm)

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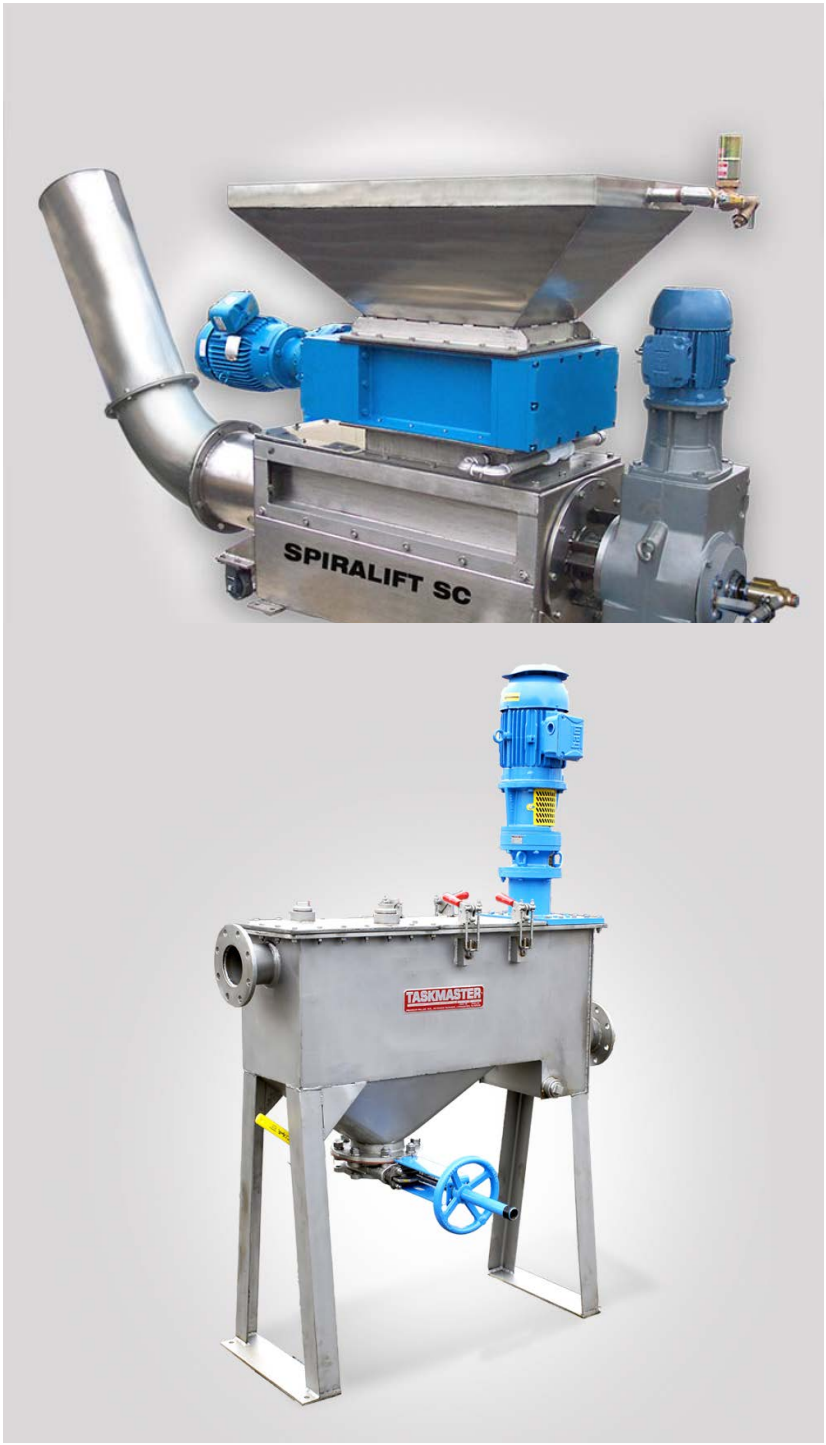

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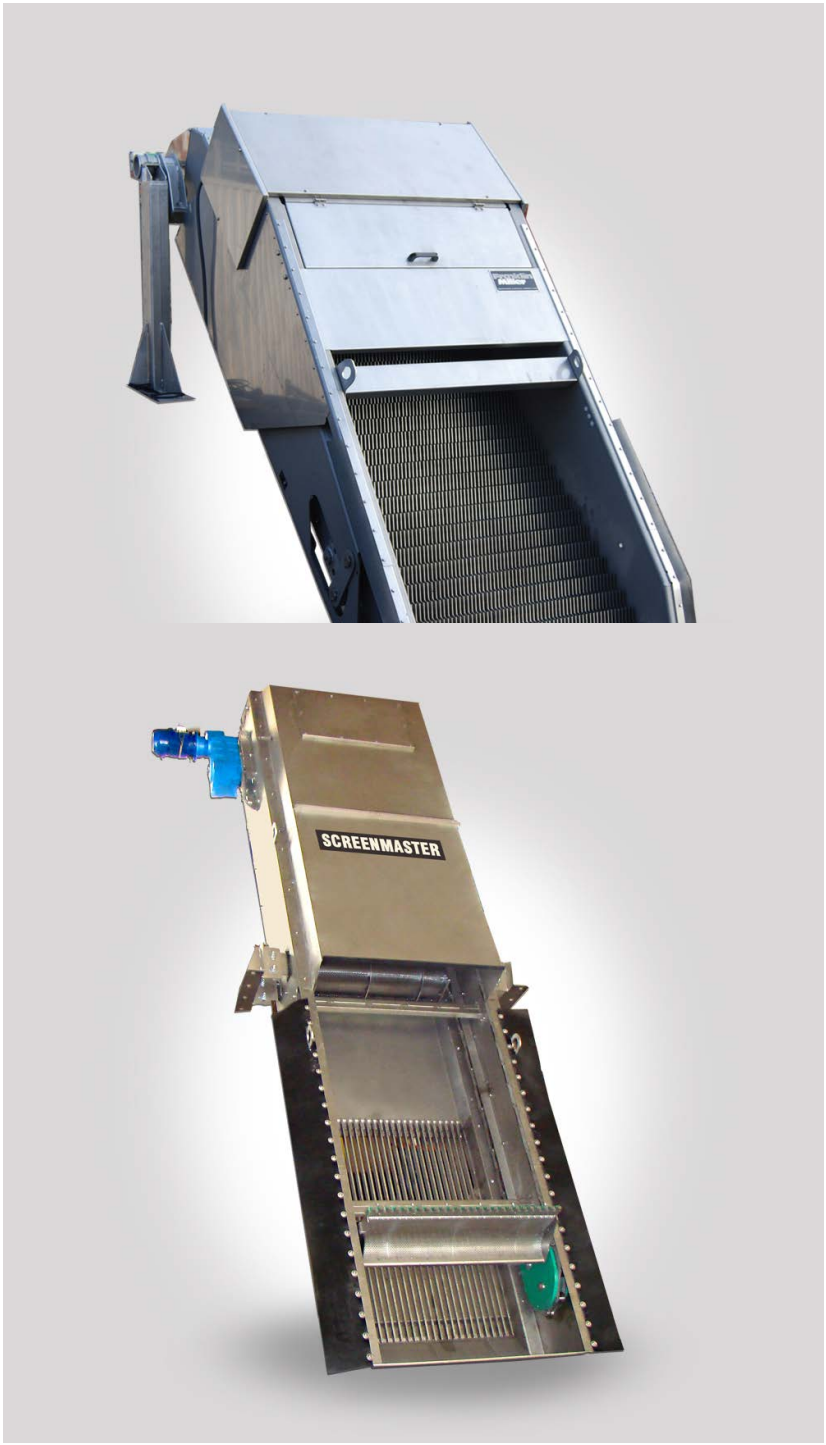

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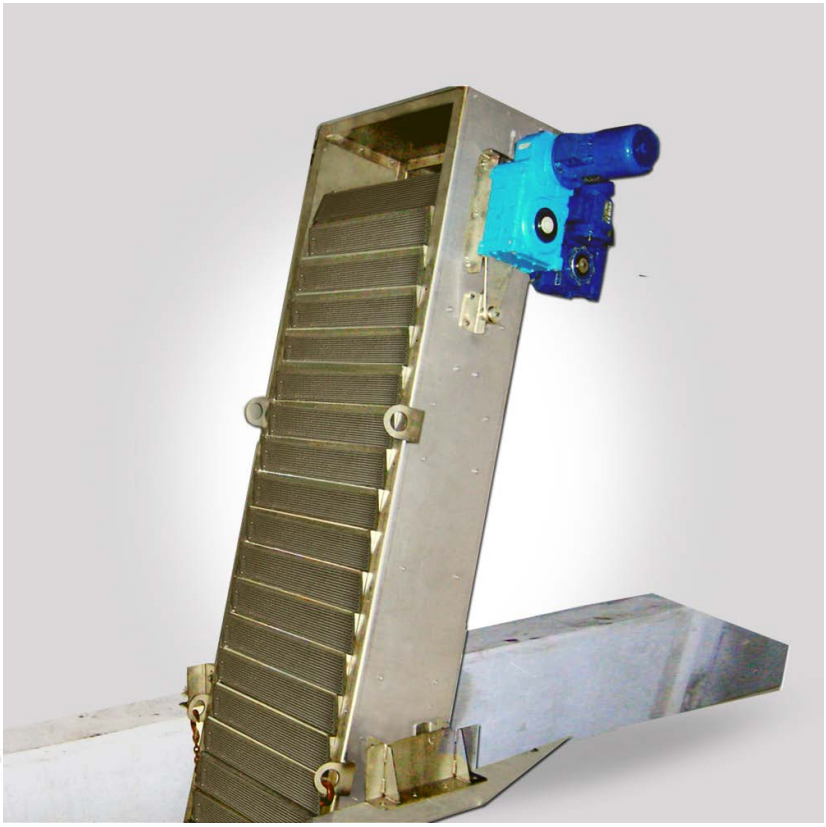

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Sacramento Electricity Rates

Commercial Electricity in Sacramento

^ The average commercial electricity rate in Sacramento, CA is 13.83¢/kWh.[1]

Residential Electricity in Sacramento

^ The average residential electricity rate in Sacramento, CA is 12.39¢/kWh.[1]

Industrial Electricity in Sacramento

^ The average industrial electricity rate in Sacramento, CA is 11.24¢/kWh.[1]

Sacramento, CA Electricity Statistics

Commercial electricity rates in Sacramento

Commercial Electricity in Sacramento

- The average commercial electricity rate in Sacramento is **13.83¢/kWh.**[1]
- This average (commercial) electricity rate in Sacramento is **3.13% greater than** the California average rate of 13.41¢/kWh.[2]

- The average (commercial) electricity rate in Sacramento is **37.07% greater than** the national average rate of 10.09¢/kWh. Commercial rates in the U.S. range from 6.86¢/kWh to 34.88¢/kWh.[2]

Residential electricity rates in Sacramento

Residential Electricity in Sacramento

- The average residential electricity rate in Sacramento is **12.39¢/kWh.**[1]
- This average (residential) electricity rate in Sacramento is **19.23% less than** the California average rate of 15.34¢/kWh.[2]
- The average (residential) electricity rate in Sacramento is **4.29% greater than** the national average rate of 11.88¢/kWh. Residential rates in the U.S. range from 8.37¢/kWh to 37.34¢/kWh.[2]

Industrial electricity rates in Sacramento

Industrial Electricity in Sacramento

- The average industrial electricity rate in Sacramento is **11.24¢/kWh.**[1]
- This average (industrial) electricity rate in Sacramento is **7.15% greater than** the California average rate of 10.49¢/kWh.[2]
- The average (industrial) electricity rate in Sacramento is **68.52% greater than** the national average rate of 6.67¢/kWh. Industrial rates in the U.S. range from 4.13¢/kWh to 30.82¢/kWh.[2]

California Electricity Rates & Consumption

Commercial electricity in California

Commercial electricity rates in CA [3]

› The average commercial electricity rate in California is **13.41¢/kWh**, which ranks **7th in the nation** and is 32.9% greater than the national average rate of 10.09¢/kWh.[3]

Commercial electricity consumption in CA [3]

› Commercial electricity consumption in California averages **5,532 kWh/month**, which ranks **30th in the nation** and is 11.32% less than the national average of 6,238 kWh/month.

Commercial electricity bills in CA [3]

› The average monthly commercial electricity bill in California is **$742**, which ranks **9th in the nation** and is 17.97% greater than the national average of $629.

Learn more about commercial electricity in California

Residential electricity in California

Residential electricity rates in California [3]

› The average residential electricity rate in California is **15.34¢/kWh**, which ranks **8th in the nation** and is 29.12% greater than the national average rate of 11.88¢/kWh.

Residential electricity consumption in CA [3]

› Residential electricity consumption in California averages **573 kWh/month**, which ranks **48th in the nation** and is 36.54% less than the national average of 903 kWh/month.

Residential electricity bills in CA [3]

› The average monthly residential electricity bill in California is **$88**, which ranks **42nd in the nation** and is 17.76% less than the national average of $107 per month.

Learn more about residential electricity in California

Industrial electricity in California

Industrial electricity rates in California [3]

› The average industrial electricity rate in California is **10.49¢/kWh**, which ranks **8th in the nation** and is 57.27% greater than the national average rate of 6.67¢/kWh.

Industrial electricity consumption in CA [3]

› Industrial electricity consumption in California averages **53,013 kWh/month**, which ranks **41st in the nation** and is 52.73% less than the national average of 112,158 kWh/month.

Industrial electricity bills in CA [3]

› The average monthly industrial electricity bill in California is **$5,561**, which ranks **34th in the nation** and is

25.68% less than the national average of $7,483.

Learn more about industrial electricity in California

How Does Your Electricity Rate Compare?

Enter Your Rate

Household Income in Sacramento, CA

Sacramento, CA Income Breakdown [4]

Income Summary for Sacramento, CA

- **Household income:** The city of Sacramento has a median household income of $14,051, versus $58,522 for the U.S.[4]
- **Compared to the U.S.:** Median household income in Sacramento is approximately 76 percent less than the median income for the entire United States.[4]
- **Poverty level:** Approximately 17 percent of Sacramento households have incomes below poverty level.[4]
- **Electric bills:** The average residential electricity bill in California is about $88/month, ranking 42nd in the U.S. and 17.76% less than the national average of $107.[5]

Income: Sacramento vs. Nation [4]

Additional information about Sacramento

About Sacramento

Sacramento is a city located in Sacramento County in the state of California, and has a population of

approximately 466,488.[6]

More about Sacramento utilities

For more information about **Sacramento electricity**, or for additional resources regarding electricity & utilities in your state, visit the Energy Information Administration.

Did you know?

Nuclear energy generated little electricity 50 years ago, but in 2011 provided more than 20% of U.S. electricity.

References

1. ^ National Renewable Energy Laboratory
2. ^ U.S. Department of Energy
3. ^ U.S. Energy Information Administration (2012)
4. ^ United States Census Bureau
5. ^ U.S. Energy Information Administration
6. ^ United States Census Bureau