County of Yolo

PLANNING AND PUBLIC WORKS DEPARTMENT

John Bencomo
DIRECTOR

292 West Beamer Street
Woodland, CA 95695-2598
(530) 666-8775 FAX (530) 666-8728
www.yolocounty.org

August 24, 2012

Yolo-Solano Air Quality Management District
Attn: Bob Dovey

RE: Wild Wings Wastewater Treatment Facility (WWTF) Odor Mitigation Action Plan, Yolo County

This letter serves as the Wild Wings CSA action plan for odor mitigation. Yolo County submits this description of how the CSA intends to follow up on the results of the Field Odor Survey conducted by Brown and Caldwell in November of 2011 and the most recent California American Water (CalAm) Field Odor Study in June/July of 2012 and recommendations made in August 2012 correspondence.

There were three main alternatives reviewed for odor mitigation at WWTF by CalAm:

1. Process Optimization
2. Chemical treatment
3. Structural Improvements

As is noted in the attached Memorandum from CalAm to the CSA on August 17, there have already been process changes implemented, which serve as the primary portion of the action plan. They are as follows:

- Provided continuous aeration of the Waste Activated Sludge (WAS) Holding Tank. This area of the plant was not aerated previously.
- Provided continuous aeration of the EQ Basin. Previously aeration air was controlled by a timer set to aerate based on time of day.
- Injected Return Activated Sludge (RAS) into the EQ Basin to facilitate increased microorganism growth.
- Reset the low level pump shut off in the EQ Basin to hold more effluent in the Basin.

Initial feedback and recent correspondence with neighborhood residents indicates that the actions taken over the last month since process changes were implemented have been successful in minimizing odors. However, should YSAQMD find that the changes do not sufficiently control odors in the future there are the following options that can be pilot tested and more thoroughly explored to serve as the secondary portion of the action plan.

1. Oxidize odor compounds prior to the EQ Basin-Inject Sodium Hypochlorite into the force main discharge at the influent pump station to the WWTP.
2. Capture odors at the EQ Basin-Misting of the Basin with fans.
3. Prevent Sulfide formation and oxidize the odor compounds-Bioxide 71 added in the lift station collection system.

At this time the CSA/Yolo County Team understands that we will continue to operate in the current mode to verify the long term success of the operations changes.

Should you have additional questions please contact me at (530) 666-8775 regarding the above.

Sincerely,

Regina Espinoza, County Service Area Manager

Attachment:
California American Water Odor Study Memorandum, August 17, 2012

CALIFORNIA
AMERICAN WATER

California American Water
4701 Beloit Drive
Sacramento, CA 95838

P 916-568-4275
F 916-568-4260

Memorandum

To: Regina Espinoza, Yolo County

From: Matt Lasecki P.E.

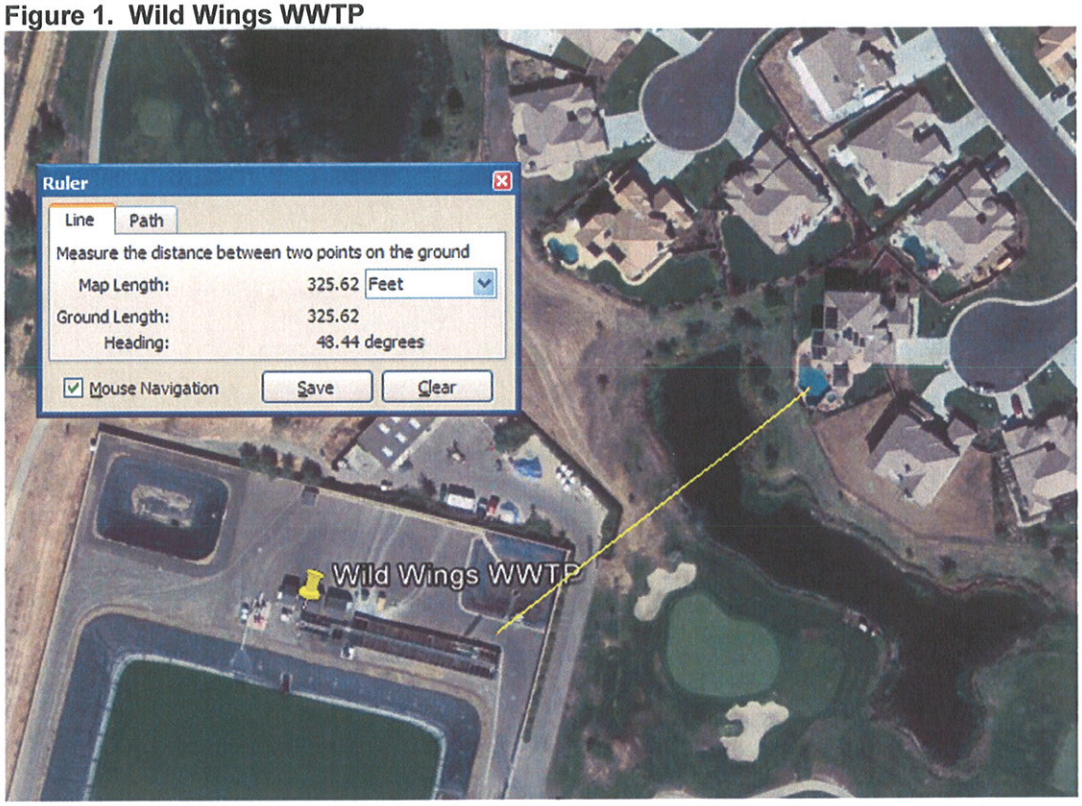
CC: Andy Soule, Richard Svindland

Date: 8/17/2012

Re: Wild Wings Odor Study

Residents adjacent to the Wild Wings Wastewater Treatment Plant (WWTP) have been concerned with odors that are believed to originate at the WWTP. This Memo provides a brief description of odors typically of wastewater treatment plants, addresses studies completed, operational changes made to date, and outlines recommended next steps in addressing these concerns. Residential proximity to the WWTP is shown in Figure 1. The nearest residence is located about 350 feet away, with several homes within 500 feet of the plant.

Figure 1. Wild Wings WWTP



Wastewater Odors

Odors originating from wastewater collection systems and treatment plants are often comprised of many different compounds. These compounds can be created by conditions present within the collection system and at different treatment processes within the plant. The more odorous compounds, those most readily detected by humans, are sulfur containing compounds which are created under anaerobic (oxygen deficient) conditions. Typical compounds and their odor thresholds are:

1. Hydrogen Sulfide – 0.5 to 0.8 ppbV
2. Sulfur / mercaptan compounds – 1 ppbV (see EPA table in attachment 1 for more detail)
3. Ammonia – 2,400 ppbV
4. Amines – 0.8 ppbV

Anearobic conditions can be present in any part of the plant and the collection system that is not aerated. Within the WWTP these conditions are readily monitored through the use of a Dissolved Oxygen probe.

Odor measurements can either be made through direct analysis or through what is called Dilutions-to-Threshold (D/T) measurements. D/T is completed by an odor panel analysis, and is a measurement that comprises the odor concentration as the number of dilutions of non-odorous air required to make the sample non-detectable by an odor panel. Wastewater treatment plants located in residential areas typically have fence line thresholds ranging from 5 to 50 D/T, with an allowance of 100 hours per year when the plant can exceed the threshold. This equates to a 99 percent compliance requirement (100 hours in 8,760 hours of operation). The 99 percent compliance requirement allows for occasional higher levels of odor hat may be due to upsets in the treatment process or other extraordinary events. (CH2M Hill, *Odor Management Plan*, 2007).

Odor Surveys

Last year Brown and Caldwell was retained to complete an Odor Survey and limited data collection. OdaLoggers were placed in three locations to measure Hydrogen Sulfide in 5 minute intervals in the collection system, within the plant, and at the WWTP property line. This study was completed in the Fall of 2011.

Subsequently, Siemens installed OdaLoggers this summer to see if warmer summer temperatures caused increased levels of Hydrogen Sulfide. A copy of that report including their proposal and cost estimate for odor mitigation is included as Attachment 4.

Both studies showed levels of Hydrogen Sulfide, although levels measured above grade and not within the wetwell were very sporadic and not consistent in nature.

Table 1. OdaLogger Summary

	Maximum Hydrogen Sulfide Measured (ppbV)		
	Influent Lift Station Wetwell	EQ Basin	Property Line
Brown and Caldwell	78	3	0.01
Siemens	50	6	NA

Odor Mitigation Options

There are three main alternatives for odor mitigation –

1. Process Optimization - this includes maintaining aerobic processes when possible to prevent sulfide generation and adding bacteria to the Equalizing (EQ) Basin to help degrade odors. Within the last three weeks, California American Water has evaluated and changed the treatment process as follows:

- Provided continuous aeration of the Waste Activated Sludge (WAS) Holding tank. This area of the plant was previously not aerated.

- Provided continuous aeration of the EQ basin. Previously aeration air was controlled by a timer set to aerate based on time of day.

- Injected Return Activated Sludge (RAS) into the EQ Basin to facilitate increased microorganism growth.

- Reset the low level pump shut off in the EQ Basin to hold more effluent in the basin.

From recent discussions with one neighbor, it appears these operational changes have contributed to a reduction in noticeable odors.

2. Chemical Treatment - This includes injection of chemicals at various locations in the process train to preclude formation or neutralize odorous compounds.

3. Structural improvements at the plant – this includes installation of covers and air handling and air scrubbing units within the plant. Improvements such as these are expensive both in terms of initial and operational capital, are not considered cost effective given the levels of odors measured, and are not discussed further in this memorandum.

Based on a site visit with AQMD, it was noted the odors from the EQ Basin were consistent with odors observed in the neighborhood. Assuming operational changes do not sufficiently control odors, chemical additive options to reduce odors at this location are possible and therefore presented in this memorandum. There are 3 additive alternatives that can be pilot tested to determine their required additive dosage and performance.

1. Oxidize odor compounds prior to the EQ Basin. Sodium Hypochlorite would be injected into the forcemain discharge at the influent pump station to the WWTP – typically 2 mg CL/mg Sulfur is needed to control sulfur odors. Due to reactions with other compounds this amount can vary and will require verification.

2. Capture odors at the EQ Basin. A mist can be applied over the basin through the use of fans. A proprietary product, Ecosorb 606, can be added to the mist water and is reported to neutralize (rather than mask) the odor containing compounds. Information on this product is included as Attachment 3.

3. Prevent sulfide formation and oxidize other odor compounds. Siemens markets a product called Bioxide 71 which contains calcium nitrate to prevent hydrogen sulfide formation and sodium chloride to oxidize other compounds. This would be added in the lift station out in the collection system. Specific information on this product is included in Attachment 4 with the Siemens report.

The estimated cost to install and operate each of these three alternatives is shown in Table 2, and included as Attachment 2. It should be noted that dosage rate ranges used in the cost estimates are as recommended by the vendors and that pilot testing of any proposed system will be needed to verify operational effectiveness and actual quantities of chemicals needed. Additionally, concurrence of the various permitting and regulating agencies will be required.

Recommendation

Initial feedback suggests that the operational changes made have had a favorable impact on noticeable odors observed by neighbors. It is recommended to continue operating the plant in its current mode to verify this potential success. The additional aeration being employed will

increase operating costs somewhat due to the increased electrical requirements. Assuming odor complaints persist, it is recommended chemical addition options be implemented. The most cost effective option, sodium hypochlorite, should be implemented in a pilot study to determine its performance. The following steps are recommended.

1. Permit the addition through the Water Board
2. Hydrogen Sulfide logging using OdaLogger at EQ basin and property line
3. Liquid Sulfide measurements in both influent wetwell and EQ basin
4. Meet with AQMD and adjacent residents to the WWTP to discuss the program and ensure both residents and AQMD complete monitoring forms during the pilot study. The more data they can offer, the more likely the program can be successful as well as optimized.
5. Modify dosages as needed
6. Cal-Am operators to log all processes that do not occur on a 24/7 or 'typical' basis.
7. Collect wind-rose data from local airfield or Sacramento airport as available

At the conclusion of the testing it is recommended that a summary memo be prepared documenting dosage added, pertinent WWTP operational data, wind speed and direction, and all field data. This summary memo should be sent to AQMD for response to determine success or failure of the pilot. Only upon failure would a less cost effective alternative be tested, or more specific odor data be collected. Based on data collected the alternatives should be reevaluated as needed.

Attachments

1. Select tables and text from EPA/625/1-85-018, Design Manual, Odor Control in Sanitary Sewerage Systems and Treatment Plants
2. Table 2 Additive Alternatives
3. Ecosorb Information
4. Siemens Report and Bioxide Information

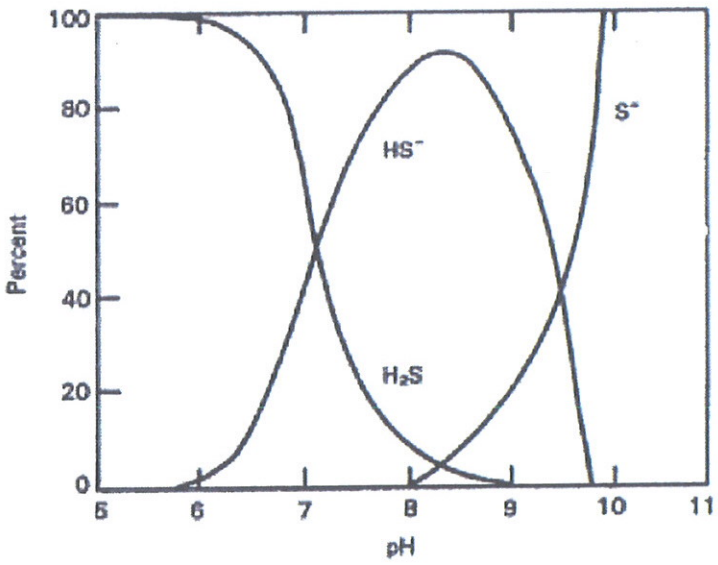
ATTACHMENT 1.

Select tables from EPA/625/1-85-018, *Design Manual, Odor Control in Sanitary Sewerage Systems and Treatment Plants*

Table 2-1. Odorous Sulfur Compounds in Wastewater (3)

Substance	Formula	Characteristic Odor	Odor Threshold ppm	Molecular Weight
Allyl Mercaptan	CH_2=CH-CH_2-SH	Strong garlic-coffee	0.00005	74.15
Amyl Mercaptan	CH_3-$(CH_2)_3$-CH_2-SH	Unpleasant-putrid	0.0003	104.22
Benzyl Mercaptan	$C_6H_5CH_2$-SH	Unpleasant-strong	0.00019	124.21
Crotyl Mercaptan	CH_3-CH=CH-CH_2-SH	Skunk-like	0.000029	90.19
Dimethyl Sulfide	CH_3-S-CH_3	Decayed vegetables	0.0001	62.13
Ethyl Mercaptan	CH_3CH_2-SH	Decayed cabbage	0.00019	62.10
Hydrogen Sulfide	H_2S	Rotten eggs	0.00047	34.10
Methyl Mercaptan	CH_3SH	Decayed cabbage	0.0011	48.10
Propyl Mercaptan	CH_3-CH_2-CH_2-SH	Unpleasant	0.000075	76.16
Sulfur Dioxide	SO_2	Pungent, irritating	0.009	64.07
Tert-butyl Mercaptan	$(CH_3)_3C$-SH	Skunk, unpleasant	0.00008	90.10
Thiocresol	CH_3-C_6H_4-SH	Skunk, rancid	0.000062	124.21
Thiophenol	C_6H_5SH	Putrid, garlic-like	0.000062	110.18

Figure 2-2. Effect of pH on hydrogen sulfide equilibrium (5).



ATTACHMENT 1

The distinction between the types of sulfide compounds is significant because only the H_2S can escape from solution and create odor and corrosion problems. It is important, therefore, to quantify the total and dissolved sulfides present and the pH of the wastewater. The amount of total sulfides occurring in the soluble form varies considerably in domestic wastewater, but most frequently appears to be 70 to 90 percent. The percentage of dissolved sulfides present varies with the pH of the wastewater and the amount of metals present.

Table 6-2. Matrix of Potential Odor-Producing Processes and Recommended Odor Control Methods

	Recommended Control Methods					
Unit Process	Chemical, Air or O_2 Addition Upstream of Plant	Aeration	Chemical Addition	Covering With Collection and Treatment of Air	Improved Hydraulics to Avoid Turbulence	Improved O & M
Flow Equalization	X	X	X			
Preliminary Treatment						
Screening	X			X		X
Grit removal	X			X		X
Preaeration	X			X		
Liquid Stream Treatment						
Primary clarification	X		X	X		X
Suspended growth systems						X
Fixed film systems			X	X		X
Phys/chem systems			X	X	X	X
Secondary clarification						X
Tertiary filtration						
Disinfection						
Sidestream returns		X	X		X	
Sludge Stream Treatment						
Gravity thickening			X	X		
DAF thickening						
Blending and storage			X	X	X	
Aerobic digestion						X
Anaerobic digestion						X
Chemical stabilization				X		
Thermal conditioning						
Mechanical dewatering			X	X		
Drying beds			X			X
Composting						X
Septage receiving/holding		X	X	X	X	

ATTACHMENT 2

Table 2
Wild Wings Odor Mitigation
Additive Alternatives

Additive	Capex	Install	Eng/PM	total	Opex Quanity per Day	Units	days	Cost Per unit	Additive Cost per Year	Notes	Total 10 yr cost	Notes
Sodium Hypochlorite	**See Note 1.** tank ($3k), pad (3k), plus chem feed skid/controls (4k)/enclosure (3k), install (3k)	$18,000	$5,000	$23,000	100.0	lbs	365	$0.18	$6,458.77	see calcs below	$87,587.75	
				$23,000	10.0	lbs	365	$0.18	$645.88	see calcs below	$29,458.77	
Ecosorb 606	2 fans ($8k) plus install	$13,000	$3,000	$16,000	0.96	gal	365	$37.73	$14,219.64	24 gal/day for each of 2 fans, with dilution of 50:1 to 250:1 = 48/50 to 48/250 gal per day, plus electrical	$158,196.36	**could be reduced 25% if not run say from midnight to 6am**
				$16,000	0.192	gal	365	$37.73	$3,643.93	**<-see note 2, included**	$52,439.27	
Bioxide 71	tank ($3k), pad (3k), plus chem feed skid/controls (4k)/enclosure (3k), install (3k)	$18,000	$5,000	$23,000	20	gal	365	$4.50	$32,850.00	10-20 gal/day	$351,500.00	
				$23,000	10	gal	365	$4.50	$16,425.00		$187,250.00	

Hypo Calcs

gal sewage /day	dosage (ppm)		hypo ppm	gpd used	lbs
75,000		20	125000	12	100.0
75,000		2	125000	1.2	10.0

Notes
1. Hypo capex could be lowered dependent upon size of tank needed. TBD during pilot.
2. Ecosorb fans if both run 24/7 is adder of approx $1k electrical per yr $1,000

ATTACHMENT 2

technical data sheet

Ecosorb™ 606

Ecosorb™ 606 is a broad spectrum odor neutralizer that can be diluted with water or used neat depending on application and delivery equipment. The product is commonly atomized into odorous process air, but can also be added to water tolerant resins, sludge, and the like to suppress the release of malodor. Given its effective strength, dilution with water ranges from roughly 1 part in 20 of water to 1 part in 400 of water and even higher. The product is a blend of essential oils, food grade surfactants, and purified water. It can be diluted with water and/or less polar solvents such as 2-propanol without expected reactions. When diluted with water, it forms a stable but weak emulsion. Whether used neat or if diluted with water, the product is safe to handle and can be disposed of down the drain.

FEATURES

- True odor neutralizer
- Biodegradable and non-toxic
- Environmentally friendly
- No measurable flash point
- Scientifically proven

ADVANTAGES

- Absorbs, reacts, and removes odors without masking
- Usually no permits required
- Safe for employees and neighbors
- Safe for all environments
- It performs as advertised

PHYSICAL PROPERTIES

pH:	~ 6.0 (see note below)
Specific Gravity:	~0.99
Boiling point:	~208° F
Appearance:	milky white
Odor:	slight citrus and floral

pH note: Ecosorb® 606 is made with purified water therefore having little ionic activity. Common pH instruments that measure ionic activity can give false low readings in the pH 4 range.

HMIS CLASSIFICATION

Health:	0
Flammability:	0
Reactivity:	0
Protective Equipment	B

ATTACHMENT 3

SIEMENS Industry

Matt Lasecki
California American Water
4701 Beloit Dr.
Sacramento, CA 95838
Ph: (916) 568-4275
Email: matthew.lasecki@amwater.com

July 6, 2012

RE: WILDWING WASTEWATER TREATMENT PLANT ODOR CONTROL
WOODLAND, CALIFORNIA
Siemens Quote No. Q120706TM1

Thank you for choosing Siemens Industry, Inc. for your odor control needs. Siemens is pleased to offer the following proposal for the supply of Bioxide® Plus 71 Solution and services for the Wild Wings Wastewater Treatment Plant.

I. Background

A service call was completed to the Wildwing Wastewater Treatment plant on 6/13. Odor complaints are currently experienced by residents nearby the treatment plant. Hydrogen sulfide monitors were placed in the equalization basin and the receiving plant lift station. Figures 1 and 2 provide data from Hydrogen sulfide monitors.

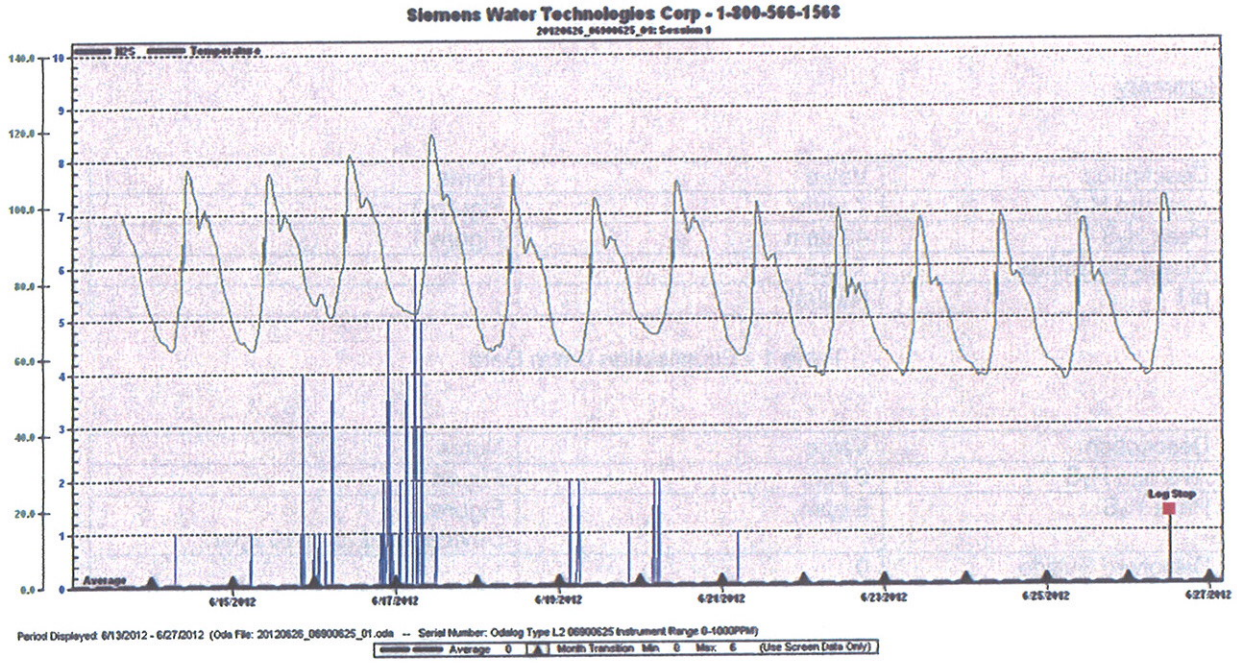


Figure 1 – Wastewater Treatment Plant Equalization Basin

Siemens Industry, Inc.
2650 Tallevast Road
Sarasota, FL 34243
USA
Tel: +1 941-355-2971
Fax: +1 941-359-7985
www.water.siemens.com

ATTACHMENT 4

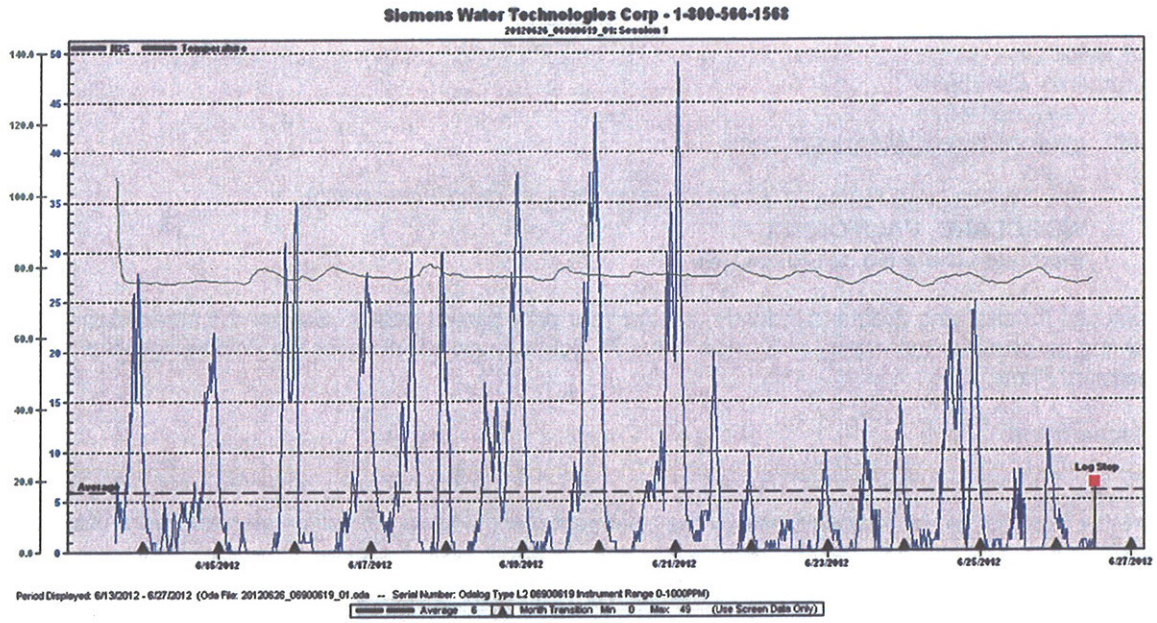


Figure 2 – Receiving Lift Station

Data Summary

Description	Value	Notes
Average H_2S	7 ppm	Figure 1
Peak H_2S	48 ppm	Figure 1
Dissolved Sulfide	Trace	
pH	Neutral	

Table 1 - Equalization Basin Data

Description	Value	Notes
Average H_2S	0 ppm	Figure 2
Peak H_2S	6 ppm	Figure 2 Device rated to +/-10 ppm
Dissolved Sulfide	0	
pH	Neutral	

Table 2 - Receiving Lift Station Data

Discussion

Odor complaints are currently received by residents in the vicinity of the wastewater treatment plant. Hydrogen sulfide present in vapor phase was measured as humans are extremely sensitive this odor (to 10 ppb). Table 1 shows peaks present in the receiving lift station to 48 ppm. Hydrogen sulfide was also measured at the equalization basin. Measured hydrogen sulfide is below the lower limit of the measuring device. It is important to note that the equalization basin is open to the atmosphere and, therefore, an emission point for reduced sulfur compounds that are characteristic of raw sewage. Siemens recommends a two stage solution to prevent odor emissions from the wastewater collection and treatment system as follows:

Stage 1 - Neutralize hydrogen sulfide in the receiving lift station as the first source of odor emission. This can be accomplished with a non hazardous liquid phase product introduced at an upstream lift station located on Mallard St. The recommended product is Bioxide® Plus 71. It is estimated to take 10 - 20 gpd to control dissolved sulfide levels in the force main. Removal of hydrogen sulfide emission from the WTP influent lift station is expected to greatly reduce the odor signature of emissions from the equalization basin.

Stage 2 - Cover the equalization basin and add a chemical scrubber configured to feed sodium hypochlorite to eliminate all reduced sulfur compounds (sewage odors) emitted from the site. A separate proposal can be developed for this option if necessary. A biofilter was initially discussed but this type of technology can only remove hydrogen sulfide and not reduced sulfur compounds from air.

II. Scope of Work (Stage 1)

Odor Control Solution

Siemens shall provide a supply of Bioxide® Plus 71 Solution in 3800 gallon loads

Equipment Summary

Siemens shall provide the following equipment:

1 4400 Nominal Gallon, Single Wall, High Density Cross Linked Polyethylene Chemical Storage Tank, (9' Diameter, 12' Tall, 1.65 Specific Gravity)

1 Complete UL Approved Stainless Steel Control and Calibration Unit to Independently Control Two Feed Pumps. The Control Unit shall consist of:

- (2) 24-Hour Time Clocks
- (1) 316 SS Control Enclosure
- (1) 15 Amp Circuit Breaker, 115 volt
- (1) Ground Fault Convenience Receptacle
- (5) On/Off Switches with LED Indicator Lights
- (1) Calibration Cylinder with Flow Control Valves
- (2) Dry Contact to Receive Signal from Remote Source

2 M-15907-002 Siemens Bellows Pumps with an adjustable feed rate from 12 to 120 mL/min and a maximum discharge pressure of 40 psi.

1 All necessary piping and fittings for the installation

Siemens retains ownership of all provided equipment. Siemens will maintain spare parts for the equipment for emergency replacement.

California American Water shall be responsible for the following:

Safety	A safety shower is not needed with Bioxide Plus 71
Dedicated Power Source	120 VAC, Single Phase; Dedicated 15 Amp circuit breaker
Floor Space/Door Allowance	15' x 15' level area

Preventative Maintenance and Monitoring Services

A Siemens service technician will visit the site to perform routine maintenance on the dosing equipment, optimize chemical dosing, conduct compliance sampling and provide a written report. On-site routine maintenance service will be scheduled in advance and include, but not be limited to the following:

- Provide quarterly maintenance and optimization services. Routine Service shall include, but not be limited to:
  1. Check the equipment for proper operation
  2. Perform sulfide sampling at the control point
  3. Perform scheduled preventative maintenance on equipment.
  4. Submit a written report outlining services and observations during the routine service visit.
- Provide emergency service to the dosing equipment.

III. SCHEDULE

Siemens can begin the program within 4-6 weeks of authorization to proceed after Siemens contract and credit approval and depending on scheduling.

IV. PRICE

Siemens Industry, Inc. is pleased to offer the following price for chemicals and services for a three (3) year period. Initial pricing is valid for one (1) year from date contract acceptance.

BIOXIDE® Plus 71Solution:	$4.50/gallon FOB delivered in 3800 gallon bulk loads. All deliveries require 5-7 business days notice from receipt of purchase order
Mobilization/Installation Fee:	$9,800.00
Demobilization	$3,500.00 (if the tank is removed and the process discontinued)
Equipment and Service Fee:	$ 980.00 per month

Terms of payment are NET 30 days from date of invoice. These prices do not include *any* applicable taxes.

The attached Siemens Industry, Inc. Terms and Conditions are considered part of this proposal and shall prevail.

Should a purchase order result from this proposal, please return the entire proposal, signed where indicated below, and address the order to:

Siemens Industry, Inc.
2650 Tallevast Road
Sarasota, FL 34243

The price associated with this quote will remain in effect for a period of ninety (90) days. If we are not in receipt of an order by the end of this firm price period, we reserve the right to modify the prices quoted.

Siemens is committed to providing the highest standard of chemical quality and technical services in the industry. If the above proposal does not meet your application requirements, I would appreciate the opportunity to discuss alternatives with you.

Thank you again for this opportunity to allow Siemens to assist you in an odor control program. If you have any questions or need additional information, please contact me at 602-284-2912

Siemens Industry, Inc.

Dave Burrows

David Burrows
Sales Representative, Municipal Services

ACCEPTANCE OF PROPOSAL

Siemens will process your order when we receive acceptance of this proposal, **Q120706TM1**, by signing below and returning the entire proposal.

This ____ day of _____Month_____Year

By: _____

Title: _____

Siemens Industry, Inc., Water Technologies Business Unit
Terms and Conditions

1. Applicable Terms. These terms, together with any quotation, purchase order or acknowledgement issued or signed by Seller (the "Seller's Documentation"), comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Customer's documents, unless separately signed by Seller. Whether the terms set forth herein are included in an offer, acceptance or acknowledgment by Seller, such offer, acceptance or acknowledgment is conditioned on Customer's assent to these terms. Seller rejects all additional or different terms in any of Customer's forms or documents. The Agreement governs the scope of work set forth in Seller's Documentation. For the purposes of this Agreement, goods shall include equipment, leased equipment and media goods (collectively, the "Goods").

2. Payment. Customer shall pay Seller the full fee as set forth in Seller's Documentation. Seller's price does not include, and Seller shall not be responsible for, any taxes, permits, tariffs, duties or fees (or any incremental increases to such taxes, permits, tariffs, duties or fees enacted by governmental agencies) unless specifically agreed in Seller's Documentation or otherwise by Seller in writing. If Seller is required to pay any such charges, Customer shall immediately reimburse Seller. All payments are due within 30 days after receipt of invoice. Customer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval.

3. Scope of Services. Seller shall provide the Goods and services specifically described in Seller's Documentation during normal business hours, unless otherwise specified in Seller's Documentation. Performance by Seller that is requested or required by the Customer outside of these hours will be charged at Seller's then current schedule of rates and will be in addition to the charges outlined in Seller's Documentation. Where the Customer requests additional Goods or services which are outside of the scope of work itemized in Seller's Documentation, Seller may provide those Goods and services at standard time and material rates and conditions then in effect.

4. Ownership of Materials. All devices, equipment, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller in connection with the provision of Goods and services hereunder, and all related intellectual property rights, shall remain Seller's property. Seller grants Customer a non-exclusive, non-transferable license to facilitate Customer's use thereof. Customer shall not disclose any such material to third parties without Seller's prior written consent.

5. Changes. Seller shall not implement any changes in the scope described in Seller's Documentation unless Customer and Seller agree in writing to the details of the change and any resulting price, schedule or other contractual modifications. This includes any changes necessitated by a change in applicable law.

6. Warranty. Seller warrants to Customer that the Goods shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship and services shall be performed in a good and workmanlike manner. The foregoing warranty shall not apply to any Goods that are specified or otherwise demanded by Customer and are not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Customer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Customer under warranty, tort or any other legal theory. Customer's service warranty is ninety days from the date of the service provided. If Customer is purchasing Goods from Seller then Seller's warranty period for Goods (except for media goods) is the earlier of one year from acceptance or eighteen months from delivery. In the event of a warranty claim, Seller shall, at its sole option and as Customer's sole and exclusive remedy, repeat the service at its own expense, repair or replace the affected parts or refund the price paid to Seller therefor. If Seller determines that any warranty claim is not, in fact, covered by this warranty, Customer shall pay Seller its then customary charges for any additionally required Goods or service. Seller's warranty is conditioned on Customer (a) operating and maintaining the Goods in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover (a) media goods (such as, but not limited to, granular activated carbon media) once such media goods are installed and testing proves material conformance to Seller's Documentation; (b) damage caused by chemical action or abrasive material or misuse which has damaged the equipment serviced; and (c) improper installation (unless installed by Seller). THE WARRANTIES AND REMEDIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES THEREFOR. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

7. Indemnity. Seller shall indemnify, defend and hold Customer harmless from any claim, cause of action or liability incurred by Customer as a result of third party claims for personal injury, death or damage to tangible property to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defense of and settle any indemnified claim. Seller's indemnification is conditioned on Customer (a) promptly, within the warranty period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.

8. Force Majeure. Under no circumstances shall either Seller or Customer have any liability for any breach (except for payment obligations) caused by extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, change in law or other act of government or any other cause beyond such party's reasonable control.

9. Cancellation. Either party may terminate the scope of work specified in Seller's Documentation by providing reasonable notice sufficient to avoid costs incurred by the other party. If Customer cancels or suspends any such scope of work for any reason other than Seller's breach, Customer shall pay Seller for work performed prior to cancellation or suspension and any other direct costs incurred by Seller as a result of such cancellation or suspension.

10. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE GOODS AND/OR SERVICES SHALL NOT EXCEED THE PRICE PAID TO SELLER THERFOR. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.

11. Leased Equipment. Any leased equipment ("Leased Equipment") provided by Seller shall at all times be the property of Seller with the exception of certain miscellaneous installation materials purchased by the Customer, and no right or property interest is transferred to the Customer hereunder, except the right to use any such Leased Equipment as provided herein. Customer agrees that it shall not pledge, lend, or create a security interest in, part with possession of, or relocate the equipment. Customer shall be responsible to maintain the Leased Equipment in good and efficient working order. Upon the expiration or termination of this Agreement, Customer shall promptly make any Leased Equipment available to Seller for removal. Customer hereby agrees that it shall grant Seller access to the Leased Equipment location and shall permit Seller to take possession of and remove the Leased Equipment without resort to legal process and hereby releases Seller from any claim or right of action for trespass or damages caused by reason of such entry and removal.

12. Miscellaneous. If these terms are issued in connection with a government contract, they shall be deemed to include those federal acquisition regulations that are required by law to be included. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Customer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Customer may not assign or permit any other transfer of the Agreement without Seller's prior written consent. The Agreement shall be governed by the laws of the State of Delaware without regard to its conflict of laws provisions.

ALL INGREDIENTS CAN BE FOUND LISTED ON THE FOLLOWING CHEMICAL SUBSTANCE INVENTORIES:

United States:	TSCA
Canadian:	DSL
European:	EINECS
Australian:	AICS

HANDLING AND PACKAGING

Ecosorb™ 606 is shipped in HDPE containers. It is recommended the product be stored, even if diluted, in HDPE, polypropylene, or stainless steel containers. Storage containers should be kept tightly sealed, long term exposure to ambient air can affect the product and it will attract airborne particulates. During storage it should not be subjected to temperatures below 35° F or above 85° F. Allowing the product to freeze is especially damaging and will disrupt the emulsion. Extended exposure to higher temperatures may cause separation, but the emulsion can be restored through agitation or mixing. The product does not burn.

DISPOSAL AND CLEANUP

Wash with water or soap and water. The product is not hazardous to humans, animals, or the environment and can be disposed of by flushing to the drain.

CONTAINERS

Ecosorb 606 is available in the following sizes:

5 Gallon Pails
55 Gallon Drums
275 Gallon Containers

Ecosorb™ ***Remarkably effective. Surprisingly simple.***

OMI INDUSTRIES

18-6 East Dundee Road, Suite 101
Barrington, IL 60010 USA
Phone: 800.662.6367
Fax: 847.304.0989
www.omi-industries.com

HOLLOW BLADED FAN

The hollow bladed fan is an innovative, simple, and effective solution for the delivery of Ecosorb® in relatively still air applications. Usually used indoors, the fan is excellent for applications where one does not want to add high moisture content to the ambient air and where localized delivery is sufficient.

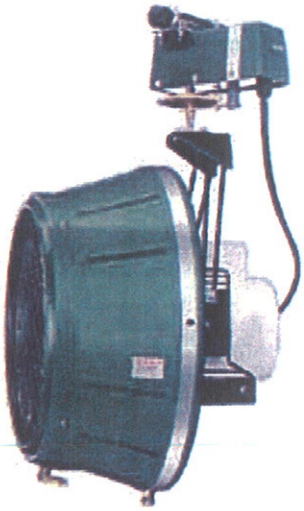


Figure 4.15: Hollow bladed fan

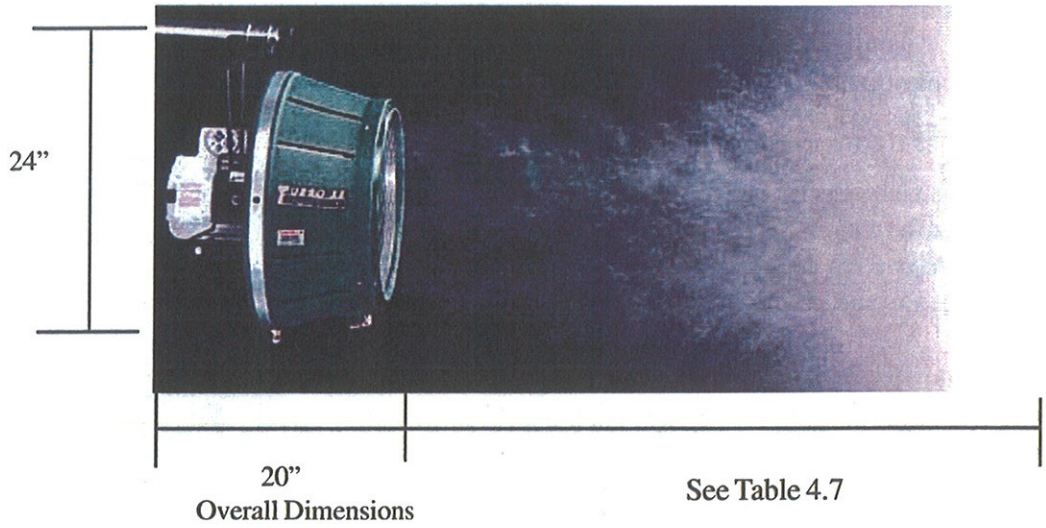
The hollow bladed fan is an electrically driven (explosion proof option is available) four-bladed fan with an orifice passage located in the longitudinal axis of each blade. Ecosorb® is delivered into the fan hub from where it is transmitted into the blades and exits the blade tips where it is well atomized.

The dispersion distance for Ecosorb® is from 30 to 60 feet (10 to 20 meters) depending on the model selected. Attaching the fan to a 360° oscillator, one can realize over 2,800 square feet (240 square meters) of coverage with one fan. The oscillating unit can be adjusted to cover from 3.75° to a full 360° of sweep range. For larger areas, one can specify multiple fans.

Installation of these fans is simple. A wheeled floor stand is available for mobile applications or low-level installations. Usually, the fans are installed in elevated wall or ceiling locations above the odor source. Two U-bolts suspend the fan assembly from a horizontal 1.25-inch (32 mm) OD steel pipe. Purpose-made wall and ceiling mount kits are also available. This installation technique is consistent with or without the optional oscillators.

The fan is only a delivery apparatus and requires a metering pump to move the dilute working solution from the container to the fan. Any adequate pump satisfies this need and it is common practice to use a diaphragm electronic metering pump. The fan comes complete with a flow meter for monitoring purposes. However, if one uses a diaphragm electronic metering pump, it is likely the flow meter will become nothing more than an indicator of liquid flow due to the rapid pulsing of the pump. If one does not specify an electronic metering pump, flow control should be included in the system. Simple system schematics are shown in Figures 4.16, 4.17 and Table 4.7.

Figure 4.16: ECS&P Odor Fan



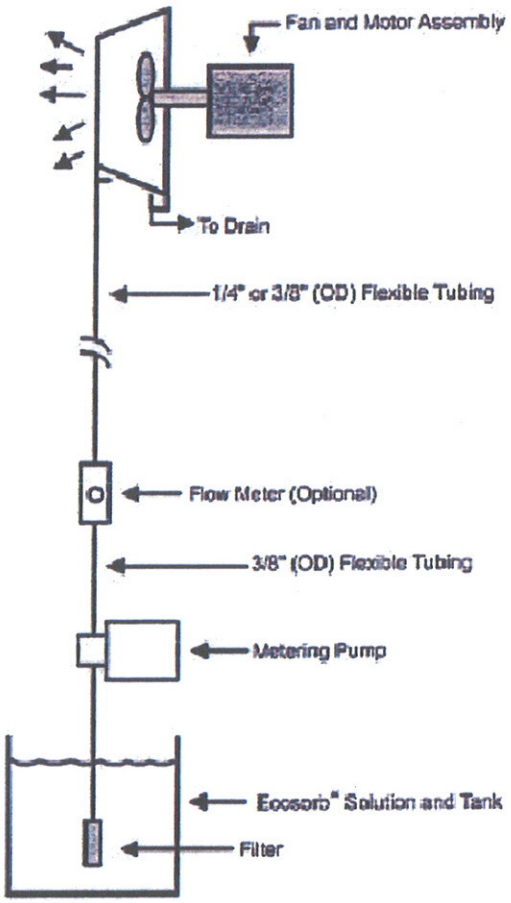


Figure 4.17: Hollow Bladed Fan System Schematic

The installation of multiple fans is possible. These are individually controlled by flow meters mounted on a fan standard control panel. An example is shown in Figure 4.18.

The liquid pump is located at ground level near the premix container of Ecosorb® and the product is pumped up to the fan(s). The engineer needs to pay attention to liquid pressure losses due to fan elevation and line length, especially if specifying a pump other than an electronic chemical metering pump. Each fan assembly has a drain line connection on the guard shroud for return condensate. This low volume of waste should be properly plumbed and disposed.

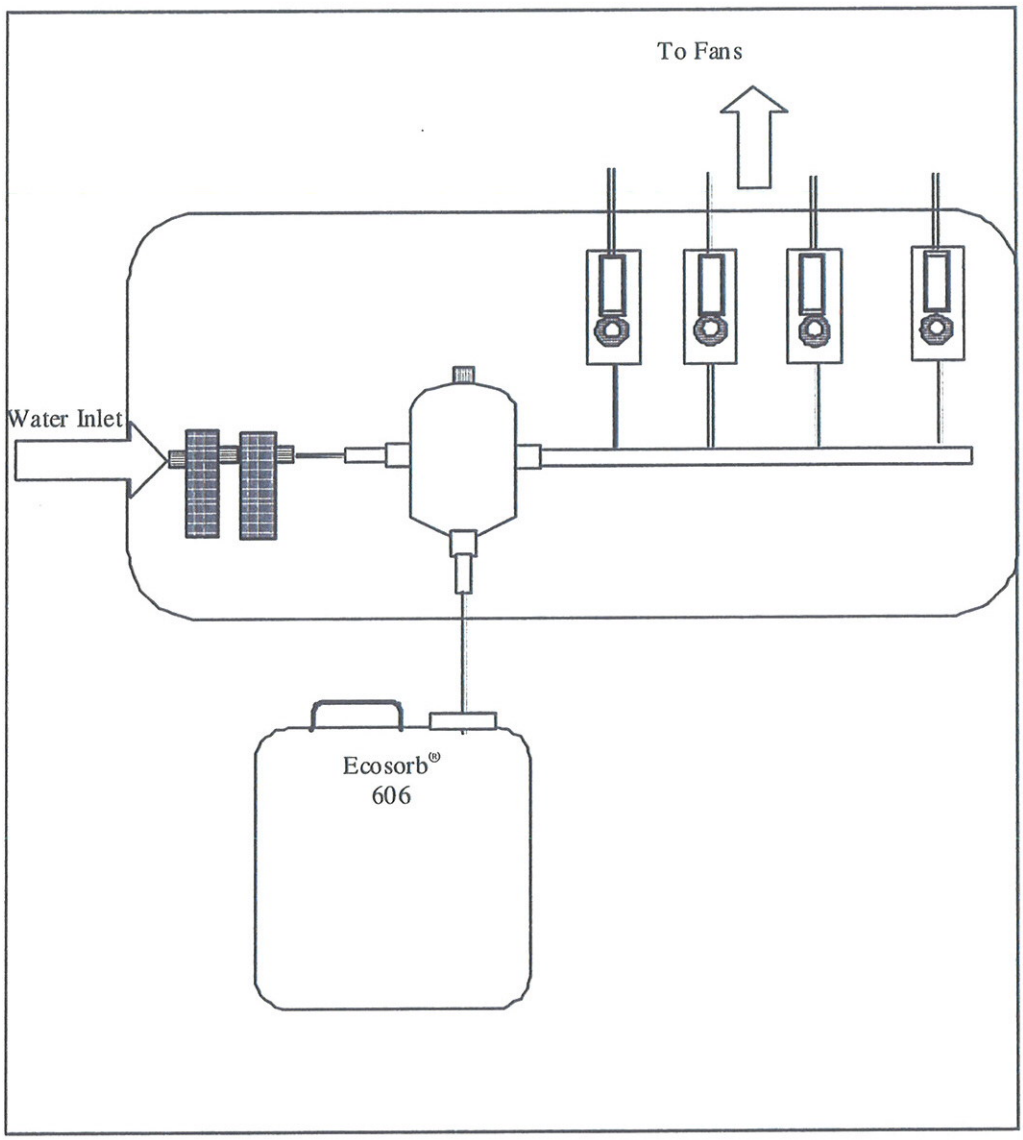


Figure 4.18: Multi-Fan Control Panel

Pump sizing primarily involves ensuring enough capacity is provided and then relying on flow control to tune the system to optimum, cost effective operation. Maximum fog output capability for the fans is quite high, from 8 to 30 GPH (0.5 to 1.9 LPH) depending on the model, thereby allowing the user to run a high volume of Ecosorb® solution. However, when delivering Ecosorb® with a fan, especially indoors and where one does not want to add significant moisture to the air, it is common to operate in the 0.5 to 1.0 GPH (30 to 130 cc/minute) range and run with higher dosages of Ecosorb®. As always, the flow rate and dosage is application sensitive.

If the pump is oversized, the flow can always be reduced with flow control. A common pump specified is a 24-gallons per day (7.0-litres per hour) electronic metering pump by "Pulsafeeder," model LPB4SAPTC1XXX.

Fan specifications are provided in Table 4.7.

Table 4.7: Model Specifications

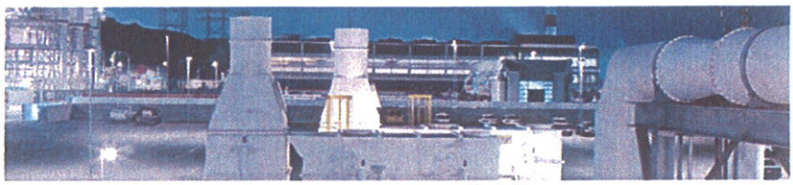
Model Number	Motor Horsepower (kW)	Forced Airflow CFM (M^3/H)	Rated Dispersion Distance-Feet (meters)	Maximum Dry Fog Output GPH (LPM)	Explosion Proof Motor Option Available[1]
ECS&P 707	1 (0.75)	3260 (5540)	30 - 70 (9 - 21)	30 (1.9)	Yes
ECS&P 720	3/4 (.55)	3180 (5400)	30 - 65 (9 - 19)	24 (1.5)	Yes
ECS&P 701	1/2 (0.37)	2730 (4640)	30 -60 (9 - 18)	20 (1.3)	Yes
ECS&P 740	1/4 (0.19)	2160 (3670)	25 - 40 (7.6 - 12)	12 (0.75)	

Table 4.7 (continued): Model Specifications

Model Number	Available Voltages for Standard Packages							Flow Load Amperage	Weight in Pounds [2]	Noise dB(A) at 10 feet
	60 HZ				50 HZ					
	115/1	230/1	230/3	460/3	240/1	380/1	575/3			
ECS&P 707	X	X	X	X	X	X	X	10.4 at 115 V/1	50	76-79
ECS&P 720					X	X		7.6 at 115 V/1	53	74-77
ECS&P 701	X	X						7.2 at 115 V/1	39	68-72
ECS&P 740	X	X						3.4 at 115 V/1	40	74-77

[1] "Explosion Proof Motors:
Class 1, Group D locations containing volatile gases
Class 2, Group F & G locations containing dust."

[2] "Add 5 to 10 pounds for explosion proof."



BIOXIDE® Plus 71 Solution for Odor and Corrosion Control

BIOXIDE® Plus 71 Solution for Odor and Corrosion Control

BIOXIDE® Plus 71 solution is a safe and natural biological approach to controlling odors and corrosion produced from reduced sulfur compounds in wastewater. In addition to the proven results achieved with patented BIOXIDE® solution, a blend component has been added which reacts with fats, oils, and grease to help minimize the accumulation of these deposits at the point of application.

BIOXIDE® Plus 71 solution is a safe and natural biological approach to controlling odors and corrosion

BIOXIDE® Plus 71 solution is a unique, proven product that achieves sewage odor control naturally, rather than chemically. This process eliminates the odor, prevents corrosion and overcomes safety concerns associated with atmospheric hydrogen sulfide.

In many wastewater streams a trace level of dissolved sulfides may be present at the nitrate addition point. To address the presence of existing sulfide, a proprietary component has been incorporated which reacts immediately with dissolved sulfide. Thus BIOXIDE® Plus 71 solution is able to both immediately react with trace quantities of dissolved sulfides and prevent the downstream formation of new sulfides. Also, this proprietary blend reacts with fats, oils, and grease to help minimize the accumulation of grease and fat deposits at the application point.

BIOXIDE® Plus 71 solution provides a source of bound oxygen (nitrate-oxygen) to naturally occurring facultative anaerobic denitrifying bacteria present in wastewater, which these bacteria metabolize preferentially over alternative sources of oxygen such as sulfate. Denitrification is a respiratory process where nitrate is reduced to nitrogen gas (N2) via a number of intermediates. The metabolic product of this reaction is inert, as opposed to odorous, toxic and corrosive hydrogen sulfide gas produced when sulfate reducing bacteria (SRBs) metabolize sulfate. BIOXIDE® Plus 71 solution is effective at controlling odors within minutes of application through days, and also results in a slight reduction in Biological Oxygen Demand (BOD). In addition to hydrogen sulfide, BIOXIDE® Plus 71 also combats most other odors commonly found in wastewater treatment systems.

Typical Applications of BIOXIDE® Plus 71 solution include:

- Lift stations/wetwells
- Force Mains
- Gravity Mains

Additional products within the BIOXIDE® solution family include:

› BIOXIDE® solution is the product of choice for the elimination of odor, corrosion and safety problems associated with hydrogen sulfide in wastewater collection systems and treatment plants. BIOXIDE® solution is a unique, proven product because it achieves sewage odor control naturally, rather than chemically.

› BIOXIDE® AE and BIOXIDE® AE 45 solutions are patented products developed to take advantage of the benefits of our BIOXIDE® solution along with the the addition of extra alkalinity into the process to increase the benefits of using one or the other chemical solution alone.

› BIOXIDE - AQ® solution is a patented product which combines our BIOXIDE® solution with the addition of AQUIT® solution to forma powerful hydrogen sulfide removal and prevention system. BIOXIDE - AQ® solution partially blocks the ability of anaerobes to utilize sulfate as an oxygen source and slows biological generation.

Features and Benefits

- Reacts with fats, oils, and grease (FOG) to help minimize the accumulation of deposits at the point of application
- Immediately reacts with trace quantities of dissolved sulfides and prevent the downstream formation of new sulfides
- Contains no hazardous substances - the only leading method of treatment for dissolved hydrogen sulfide which is not on the EPA CERCLA list of hazardous substances
- Reduces BOD loading
- Treats other common sewage odors - odorous sulfur compounds such as mercaptans and organic sulfides
- Reduces future corrosion by effectively eliminating dissolved hydrogen sulfide, the source of atmospheric hydrogen sulfide
- Safe, easy-to-handle method of odor control

Siemens Water Technologies is a leader in the development of innovative products for the control of odors in wastewater collection and treatment systems. In addition to our full line of products, we also offer field support services that help save time, money and manpower. › Learn more about our odor control services

Contact Us
Municipal Services Sales Team

941.359.7917
› Send Email
› Request a Proposal

Not all products and services are available in all parts of the world. Contact us to discuss your needs.

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We respect your privacy and will never sell or rent our subscriber list.

Documentation
› BIOXIDE® Plus 71 Solution - Proprietary Blend
› BIOXIDE® Solution for Odor Control - Family of Products
› BIOXIDE® AE Solution - Alkaline Enhanced, Non-Hazardous
› BIOXIDE® AE 45 Solution - Alkaline Enhanced
› BIOXIDE® AQ Solution - AQUIT® Solution Enhanced

Support Services
Siemens offers liquid phase odor control sales and service support from 7 convenient regional locations in the US.

Odor and Corrosion Control
Siemens Water Technologies is a recognized leader in the development of innovative products for the control of odors in wastewater collection and treatment systems. Due to site variation, there is no single best solution, nor is there a "one size fits all" approach to solving every odor and corrosion control application. Siemens' treatment recommendations are based on data collected at your site and may include one or more odor control products to achieve the best results and in a cost effective manner.

› Learn more about Siemens' liquid phase odor and corrosion control capabilities