CALIFORNIA WASTEWATER PROCESS OPTIMIZATION PROGRAM

PRE-INSTALLATION

FACILITY AUDIT REPORT

SAN LEANDRO WASTEWATER TREATMENT FACILITY

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CALIFORNIA WASTEWSATER PROCESS OPTIMIZATION PROGRAM (CALPOP)

Facility Audit Report

SAN LEANDRO WASTEWATER TREATMENT FACILITY

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EXECUTIVE SUMMARY

One Energy Efficiency Measure (EEM), a high efficiency aeration blower upgrade (Aeration Blowers EEM), was evaluated at the San Leandro Wastewater Treatment Facility (WWTF), owned and operated by the City of San Leandro. An investment grade audit was performed. The Aeration Blowers EEM showed an attractive simple payback (under six years with incentive). This measure is straightforward, and could be completed in-house in about one year.

Table E1 - San Leandro Energy Efficiency Measure Summary

Energy Efficiency Measure (EEM)	Description	Demand Savings (KW)	Energy Savings (Annual KWh)	Electrical Cost Savings ($/Yr)	EEM Capital Cost ($)	Simple Payback Period (Years)	Incentive Rebate ($)	Adjusted Payback Period (Years)
Aeration Blowers	Turbo, PD Blower Retrofit	10	276,000	$29,600	$195,000	6.6	$25,800	5.7

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DISCLAIMER

California consumers are not obligated to purchase any full-fee service or other service not funded by this program. This program is funded by California utility ratepayers under the auspices of the California Public Utilities Commission (CPUC).

The recommendations in this report assume implementation by facilities personnel familiar with building equipment, and operations and/or contractors experienced in the related fields. The recommendations are not intended to be fully detailed, or standalone instruction sets.

Payback periods are highly dependent on means and methods of implementation. Prices will vary widely depending on whether facility personnel, corporate support personnel or pre-approved contractors are utilized, as well as whether the recommended measures are sent out to bid. We have used historical data, Means Mechanical Cost estimates and experience to arrive at the tabulated figures. In some cases, we have assumed that maintenance personnel will implement the measures recommended, i.e., cogged belt replacement and simple software programming modifications.

INCENTIVES

The incentive amount will be calculated on an aggregate basis for the total retro-commissioning and retrofit energy conservation measures. The incentive amount depends on the percentage of measure implementation. Currently, the calculated incentive amounts are preliminary and subject to change. The program incentive forms will be provided. Incentives for measures, given in cost per kWh, are shown in Table E-1 below.

Table E-1
Measure Incentives †

Energy Efficiency Measure	$/KW (Peak Demand)	$/KWh (First Year Energy)
Aeration Blower	$100	$0.09

† In no case shall the incentive exceed 50% of the installation costs. This incentive cap will be applied on a portfolio basis.

* Definition of Peak Demand, per CPUC developed by DEER, is "*the average grid level impact for a measure between 2:00 p.m. and 5:00 p.m. during the three consecutive weekday periods containing the weekday temperature with the hottest temperature of the year.*"

1. INTRODUCTION

One Energy Efficiency Measure (EEM), a high efficiency aeration blower upgrade (Aeration Blower EEM), was evaluated at the San Leandro Wastewater Treatment Facility (WWTF). This measure was chosen following a walkthrough of the facility, and discussion with facility staff. They have a cogeneration system using digester gas, which can supply approximately 60% of plant load. The facility purchases all remaining electrical power from PG&E, which totaled 3.2 million kWh from May 2010 through April 2011.

1.1 Project Process Overview and Objectives

A technical investigation and investment grade audit was performed for the EEM. The objectives of the study were to establish the soundness of the EEM from both an operational and financial standpoint, and estimate the electrical energy and demand savings that could be expected. The facility maintains blower electrical current, airflow, and aeration system pressure readings on the SCADA (Supervisory Control, Alarm, Data Acquisition) system's historical trending feature. Spot measurements of power and aeration system pressure were made to verify the SCADA readings. The baseline energy demand for the blowers was established for calendar year 2010 based upon hourly SCADA data samples. The process considerations for the EEM involved estimating how much power demand will be reduced from baseline by improving blower efficiency. Energy savings were translated into electrical cost savings.

1.2 General Facility Description

The San Leandro Wastewater Treatment Facility (WWTF) is owned and operated by the City of San Leandro. The WWTF is called H2OWorks. It serves about 50,000 residents, numerous businesses and 22 industrial facilities. It receives the highest concentration of treatable waste of all the major Bay Area WWTF's, as measured by Biochemical Oxygen Demand (BOD). The average daily flow to the WWTF is 5 Million Gallons per Day (MGD), with a design dry weather flow of 7.6 MGD, and wet weather spikes up to 23 MGD. The treatment train provides secondary level treatment with primary clarifiers, a fixed film reactor (trickling filter), aeration basins with fine bubble diffusers, hypochlorite disinfection, and dechlorination. 90% of the treated effluent is discharged to the San Francisco Bay via the East Bay Discharge Authority (EBDA), and the remaining 10% of the effluent is used for commercial irrigation. Secondary biosolids are thickened with polymer and a rotary drum thickener, then combined with primary biosolids and sent to an anaerobic digester. Methane from the anaerobic digester is fed to cogeneration engines, supplying 60% of plant electricity, and 100% of the heat to operate the digesters. The digested biosolids are then dewatered with belt filter presses, and taken to drying beds to produce Class A biosolids.

Figure 1.2.1 provides and aerial view of the San Leandro WWTF and identifies the component operations in the Facility's treatment process.

Figure 1.2.1 -- Aerial View of the San Leandro WWTF

Plant Treatment Components: 1 – Headworks; 2 – Primary Clarifiers; 3 – Fixed Film Reactor; 4 – Aeration Basins; 5 – Secondary Clarifiers; 6 – Disinfection; 7 – Discharge; 8 – Secondary Sludge Thickener; 9 – Anaerobic Digester; 10 – Cogeneration; 11 – Biosolids Dewatering

2. TARGETED PROCESS SYSTEMS AND EQUIPMENT

2.1 Description of Facility and Operational Systems

2.1.1 Aeration Blower Retrofit

Two 659,000 gallon aeration basins are supplied with air by three 150 HP Lamson multistage centrifugal model 867AD blowers, as shown in Figure 2.1.1.1. Only one of the two basins is in operation (online) at any given time; the other is offline in a standby mode. Aeration is accomplished with fine bubble diffusers. The offline basin maintains a water cover over the diffusers, which are usually supplied air to keep the diffusers in operation.

Figure 2.1.1.1 – San Leandro Multistage Aeration Blowers

A single Dissolved Oxygen (DO) sensor supplies the signal to regulate the total amount of air supplied to the online basin. Each basin has four aeration zones, with manually controlled air proportioning valves for each zone. The DO sensor is located in the third zone. All of the existing blowers are constant speed, whereas air supply to the online basin is controlled partially by throttling the blower suction, and additionally venting air to the offline basin. A single blower can supply almost all the aeration demands of the online basin.

The existing multistage blowers have limited turndown capability, and significant energy is wasted by excessive venting to the offline basin when there are low airflow requirements to the online basin. At higher flows, when no excessive air is being vented, the Lamson blowers perform efficiently. Newer blowers on the market have a better turndown capability, and replacing one Lamson blower with a suitable new blower could reduce or avoid excessive venting. In addition, the air required at the offline basin could be supplied much more energy efficiently with a dedicated low pressure blower and additional piping.

2.2 Control Systems

The treatment plant is controlled by Direct Logic 205 Programmable Logic Controllers (PLCs). The operator interface and historical trending system is Citect SCADA software running on IBM PC compatibles.

2.3 Energy Saving Analysis

2.3.1 Aeration Blower Retrofit

The facility SCADA system recorded the entire process data essential to perform the audit for blower replacement: discharge airflow and pressure, electrical current for each blower, and DO. On March 3, 2011, the accuracy of the discharge pressure sensor was verified. On March 17, 2011, at each blower, on-site spot power measurements were made to 1) verify the SCADA current readings were accurate; and 2) establish the power factor of each blower and the ratio of measured current to true power. The individual power factors for each blower were used to convert amperage to power.

To establish an annual airflow demand and power baseline, one hour samples of the SCADA airflow data, blower discharge header pressure, blower current and dissolved oxygen were downloaded as a time sequence table for calendar year 2010. The two aeration basins are called A and B. Each basin has its own automatic air control valve, air distribution manifold, and airflow meter.

The operators switch treatment from one basin to the other periodically. The 2010 airflow data revealed that Tank B was online (used for treatment) from January 1 to April 14 at 12 noon; while Tank A was offline. Tank A was used for treatment for the remainder of 2010 with Tank B offline. Of the Tank A and B air flow signals, the one that periodically drops to zero indicates the air vented to the offline basin. The airflow signal that always has flow indicates the online basin.

The blower discharge pressure sensor was not reading correctly during much of 2010, but as noted above, was verified to be operating correctly by March 2011. Therefore, a three week period of SCADA data, from March 3 to March 17, 2011, was also downloaded using 15 minute intervals to establish the relationship between online basin airflow and system pressure, measured at the blower manifold. The system pressure rises with airflow from increased friction, mainly at the diffusers.

The airflow performance baseline analysis treats the online basin air delivery separately from the air sent to the offline basin, since the recommended measure will have them supplied with different blower systems. The online air will be referred to as process air in the discussion of results. The process air comprises the vast majority of energy required, and is given the most attention in the analysis.

The time sequence 2010 and 2011 blower baseline data was imported into Microsoft Access 2003 for aggregation into airflow bins. The airflow bins were based on process airflow only. The total power of all three blowers was averaged in each airflow bin to establish the baseline power vs. process airflow for the existing Lamson blowers and control system.

To validate the 2010 baseline, the performance of the blowers recorded in the SCADA system was validated against the existing Lamson blower factory curves. They were also compared to a March 3, 2011 spot measurement of flow, power, and discharge pressure with one blower operating at full output. There were two important correlations to validate: 1) the power required vs. airflow and 2) the system pressure required vs. airflow.

The pressure at the aeration blower discharge is critical to estimating the blower power consumption vs. airflow. The blower discharge pressure will be higher than the system pressure measured, due to friction from fittings between the discharge point and the system pressure measurement point. We used a conservative estimate of 1 psig for this friction loss; a well designed piping system should be substantially less, but in a retrofit scenario optimal discharge pipe design is often not feasible.

Vendors of Neuros and ABS turbo blowers and EE-PAC positive displacement blowers provided performance curves for blowers sized to operate over the lower to mid airflow range. Minor adjustments had to be made to each performance curve relation to compare all three blowers under the same operating conditions. These adjustments were either for discharge pressure or inlet temperature. The adjustments were made with the thermodynamic efficiency equation, by keeping the efficiency constant while inputting temperature or pressure adjustments, as well as using the adjusted blower power requirement in the performance estimate.

A Sutorbilt lobe-type constant speed positive displacement blower (PD) was used for performance and cost estimation to supply air to the offline basin. Its energy demand was minor compared to the process air, and a constant discharge pressure was estimated based on a minimal water cover depth,at the airflow preferred by operations staff.

A time of use power baseline cost and savings analysis was done based on June 2011 E19P rate tariff using a monthly billing summary from June 2010 to May 2011 in order to weight the various time-of-use rate periods. From this analysis, a blended energy and demand rate was applied to the 2010 baseline data to determine annual cost savings.

Assumptions in the energy analysis process:

1. The SCADA airflow readings are accurate across the entire range.
2. When one or more existing Lamson blowers are required to supplement the retrofit blower at higher flows, the power required is the same as measured at baseline, smoothed with a regression fit linear relationship.
3. When operated post retrofit, the existing Lamson blowers will maintain the same relationship between system pressure and airflow as the baseline.
4. The system pressure vs. airflow relationship established in March 2011 extrapolates in a linear fashion to airflows above the measured data.
5. There will be a pressure drop of 1 psig between the high efficiency retrofit blower discharge point and the baseline system pressure measurement point, to allow for pipe friction losses.
6. The average ambient temperature is 65 F, for the purposes of estimating blower power consumption.

7. The low pressure blower supplying the offline basin will require no more than 2 psig discharge pressure, including line losses.
8. The maximum process air demand post retrofit will be 400 SCFM less than baseline, as a result of the low pressure blower supplying air to the offline basin. The peak power demand of the post-retrofit process air blower system will be reduced in proportion to the slope of baseline airflow vs. power, in the 4000-7000 SCFM airflow range.
9. The average billing period maximum power demand from the blowers during the baseline year is taken as the average of the peak power readings in each of the twelve calendar months of hourly SCADA samples. The peak period maximum demand is assumed the same as the overall maximum demand.

3. RECOMMENDED ENERGY EFFICIENCY MEASURES

3.1 Summary of Identified Energy Efficiency Measures

Table 3.1.1 provides a energy and economic performance of the identified blower replacement EEM.

Table 3.1.1 – Performance Summary of the Blower Replacement EEM

Energy Efficiency Measure (EEM)	Description	Demand Savings (KW)	Energy Savings (Annual KWh)	Electrical Cost Savings ($/Yr)	EEM Capital Cost ($)	Simple Payback Period (Years)	Incentive Rebate ($)	Adjusted Payback Period (Years)
Aeration Blowers	Turbo, PD Blower Retrofit	10	276,000	$29,600	$195,000	6.6	$25,800	5.7

3.2 Energy Efficiency Measure Description

3.2.1 Aeration Blower Retrofit

The fixed speed Lamson multistage blowers each have a design capacity of 3400 SCFM, where they are reasonably energy efficient for the supply of process air. However, they do not turn down efficiently, and most process airflow demands are well below one blower's design point. The blowers do have suction throttling, the most energy efficient way to reduce the output of multistage blowers. Suction throttling is often limited by blower surge; the point where the blower encounters a compression ratio greater than it was designed for. In the range of 1000-3000 SCFM, a new high efficiency blower with better turndown will reduce energy consumption. The new blower would replace one of the existing Lamsons. It would have almost the same capacity, so there would be minimal loss of spare capacity.

In addition, the air delivery piping system will be modified to allow a new low pressure blower capable of delivering 400 SCFM to supply air to the offline basin, to maintain its diffusers in operation.

Table 3.2.1.1 shows the baseline and estimated post-installation energy and cost parameters used in estimating project energy and cost savings from the blower replacement EEM.

Table 3.2.1.1 Measure Savings Summary

Item	Baseline	Proposed	Savings
Blower System Description	Three 150 HP Multistage Lamson Blowers	One 100 HP Turbo Blower, One 10 HP PD Blower, Two Multistage Lamson Blowers	-
Power Demand KW max	169	159	10
Annual Energy KWh	844,000	568,000	276,000
Blended Demand Charge $/KW	$209	$209	
Blended Energy Charge $/KWh	$0.100	$0.100	
Annual Power Costs	$119,500	$89,900	$29,600

3.2.1.1 Description of Findings

The venting of air to the offline basin is a significant source of energy waste. At the lowest air demands, more air is vented than is used in the treatment process. On average, 24% of the blower discharge was vented to the offline basin in 2010. This vented air is not completely wasted – it keeps the diffusers in the offline basin operational while they are kept covered with a foot or two of water. Operations staff prefer to maintain at least 400 SCFM air flowing through the offline basin. However, the pressure required to supply the air to the offline basin is 1-2 psig, due to the low water level covering the offline diffusers. Using 5+ psig process air and dropping the pressure through a control valve wastes substantial energy, even at the preferred 400 SCFM airflow.

In the analysis that follows, the main focus is on the energy performance of process air supply to the online basin. This serves our intent to propose supplying air to the offline basin from a separate low pressure blower system. To simplify the analysis, we first assume all the baseline energy demand is for process air, and the vented air is simply waste. From an energy standpoint, this is virtually true, since most of the energy imparted to get the air to 5+ psig is lost through the control valve regulating flow to the offline basin.

In Figure 3.2.1.1.1 below, the 2010 baseline process airflow demand and energy performance of the existing aeration system is summarized. The flow frequency peaks at 2000 SCFM, and most airflow demand is below 3500 SCFM. The power demand of the existing blowers is nearly constant up to 3000 SCFM, then climbs in proportion to process air demand at higher airflows. There are two validation points shown for the energy baseline. The Factory Curves point is the intersection of system pressure and the Lamson factory flow vs. pressure curve, combined with the corresponding point on the factory power vs. flow curve. This indicates the baseline flow and power measurements are in agreement with the stated energy efficiency of the Lamson blowers. Also, a March 3, 2011 spot observation of process airflow and power is in agreement with the 2010 baseline relationship. From these observations, we have confidence the power and airflow measurements are reasonably accurate.

Figure 3.2.1.1.1 – 2010 Baseline Energy Performance and Process Airflow Demand

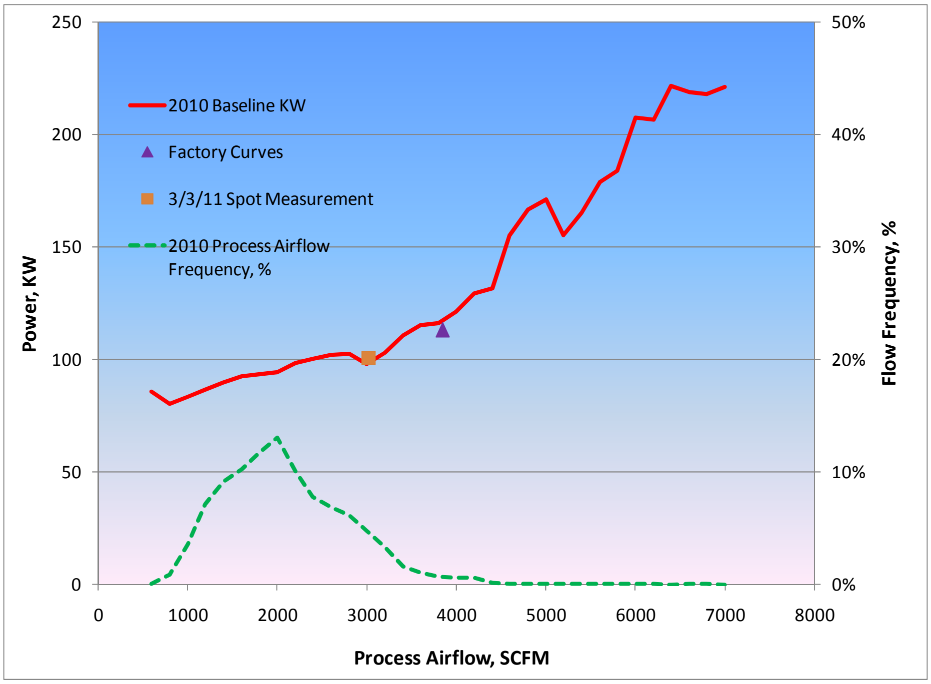
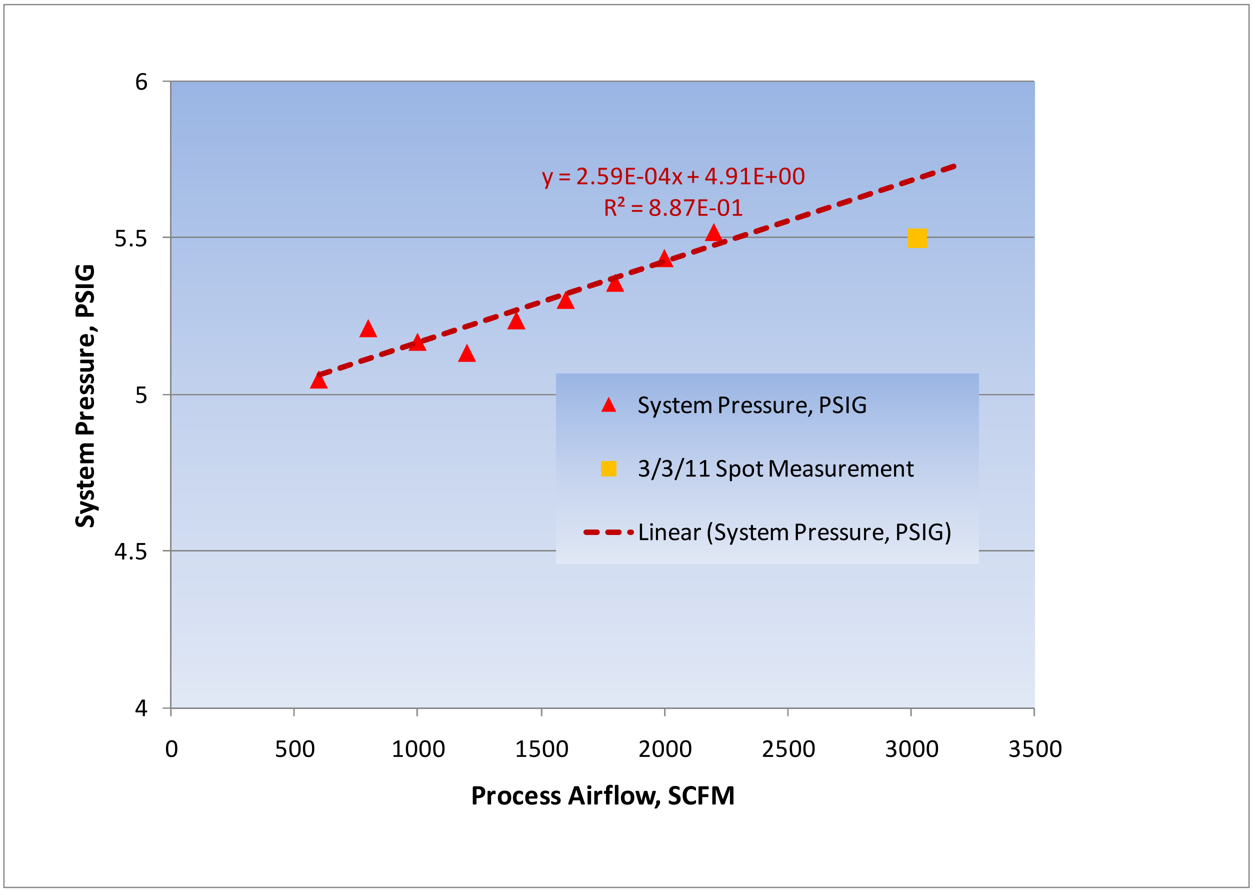


Figure 3.2.1.1.2 shows the relationship between system pressure, measured at the blower manifold, and process airflow bins, as determined during the March 2011 three week study. The airflow during this period was limited to the lower flow range. A linear regression fit of the data resulted in the correlation shown on the figure. This correlation was extrapolated to higher airflows as needed to estimate the system pressure vs. airflow requirements for the retrofit options that were evaluated. The March 3, 2011 spot measurement indicates ~0.2 psig lower actual system pressure than predicted by the extrapolated correlation.

The March 3rd spot measurement also revealed the flow recorded by the SCADA system was considerably less than expected from the factory curves, if the blower were only moving air from atmospheric pressure to system pressure. The blower suction valve was partially closed during the spot measurement, increasing the pressure drop the blower was acting upon, and reducing flow accordingly. Some additional pressure drop, however, will be the result of friction on the discharge side of the blower prior to the pressure measurement at expansion joints and elbows. From the factory curve, the blower pressure differential appears ~2 psi greater than the system pressure spot measurement. For the purpose of estimating the retrofit process air pressure requirements, we split the apparent 2 psig extra pressure drop between the blower suction valve loss, which will be eliminated for the high efficiency blower and the discharge piping loss, which may remain the same for the high efficiency blower. Stated differently, we add 1 psig to the measured system pressure to estimate the pressure required at the retrofit blower discharge.

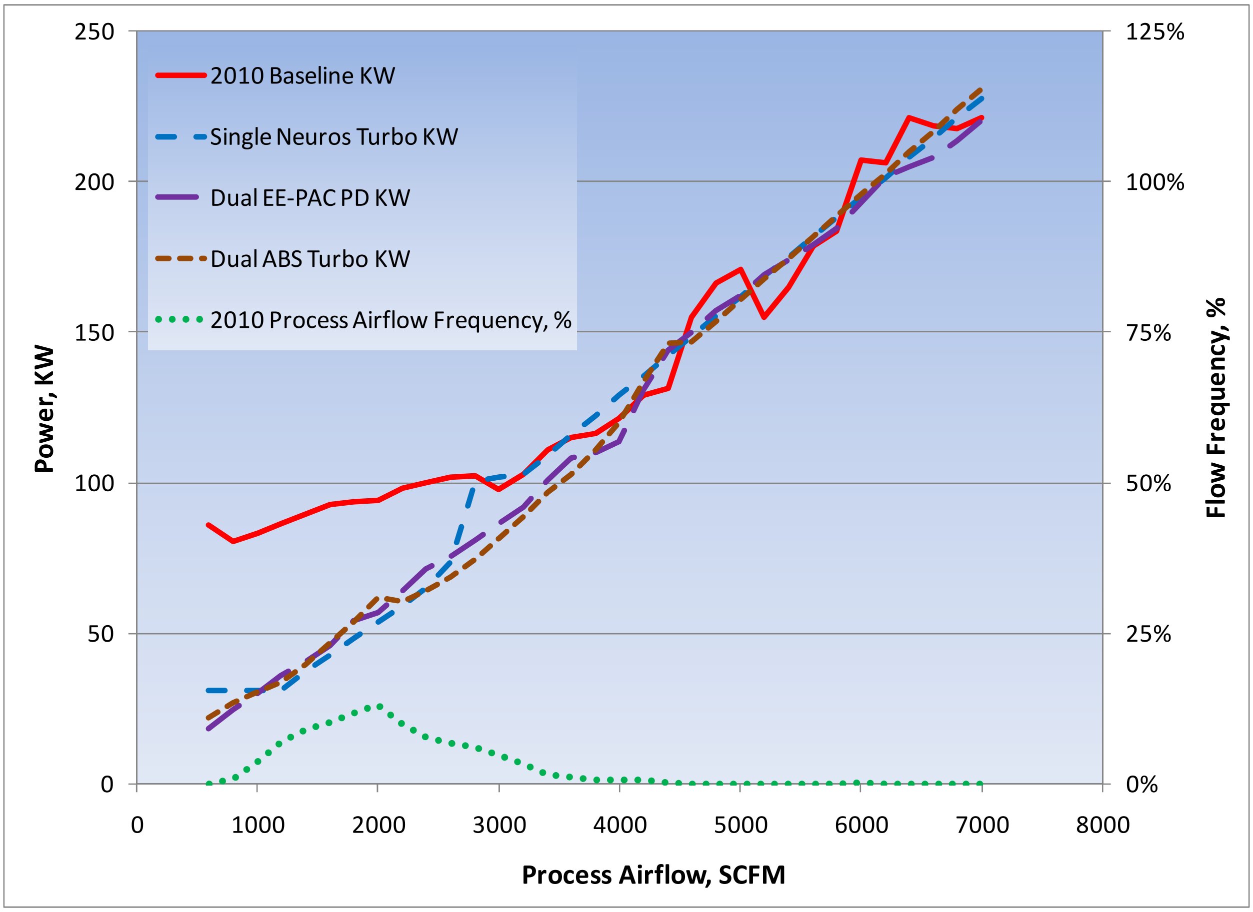
Figure 3.2.1.1.2 – System Pressure vs. Process Airflow



Three types of high efficiency blower systems were evaluated as process air system retrofit candidates: 1) a single 100 HP Neuros turbo blower, 2) dual ABS turbo blowers, at 93 and 200 HP operated sequentially, and 3) dual Universal EE-PAC 60 HP positive displacement lobe type blowers operated separately and in tandem.

Figure 3.2.1.1.3 below compares the energy performance of the three retrofit options supplying air over the 2010 baseline demand range. While there is infrequent demand above 4000 SCFM, we analyzed retrofit performance up to 7000 SCFM to demonstrate the 2010 baseline airflow capacity remains post-retrofit. The high efficiency systems can improve low air demand energy efficiency and be supplemented with the remaining Lamsons to provide high airflow demands, all the way to 7000 SCFM.

Figure 3.2.1.1.3 – Energy Saving Performance of High Efficiency Blower Retrofits



The single Neuros option was sized to handle the flows where the existing Lamsons are least energy efficient, up to 2600 SCFM. The two dual blower options could operate to 4000 SCFM, covering almost all the 2010 baseline airflow demand. All three retrofits offer similar power reductions of up to 2600 SCFM, as shown by their proximity in the figure. The dual blower options continue to perform nominally better than baseline up to 4000 SCFM. At the airflows above 4000 SCFM, the existing Lamson blowers perform adequately. This only represented 1.2% of the airflow demand in 2010; as a result, there is little energy saving incentive to improve efficiency in this high airflow range.

Table 3.2.1.1.1 below shows the annual savings for all three process air retrofit options are close. The turbo blowers (ABS and Neuros) are nominally more energy efficient, and two turbo blowers are better than one. However, the incremental energy savings from the second turbo blower does not justify the added capital cost. Likewise, the higher capital cost of the two positive displacement blowers result in a less attractive payback than the single turbo blower.

The low pressure air supply system for the offline basin will require relatively little energy, due to low airflow and pressure requirements. A constant 400 SCFM will be required at an estimated maximum pressure of 2 psig. A 10 HP fixed speed Sutorbilt positive displacement (PD) blower is recommended, as it will maintain an almost constant airflow even if the discharge pressure fluctuates, and will require minimal capital cost. A high efficiency blower will not produce significant savings, and few are available at this size. The estimated power demand is 3.6 KW, or 31,900 kWh annually.

Table 3.2.1.1.1 – Energy Usage Summary for Process Air Retrofit Options

Blower Make	Blower Rated HP	Annual Process Air Energy, KWh
ABS	1 - 93 HP, 1 - 200 HP	524,000
APG Neuros	1 - 100 HP	536,000
Universal EE-PAC	2 - 60 HP	539,000

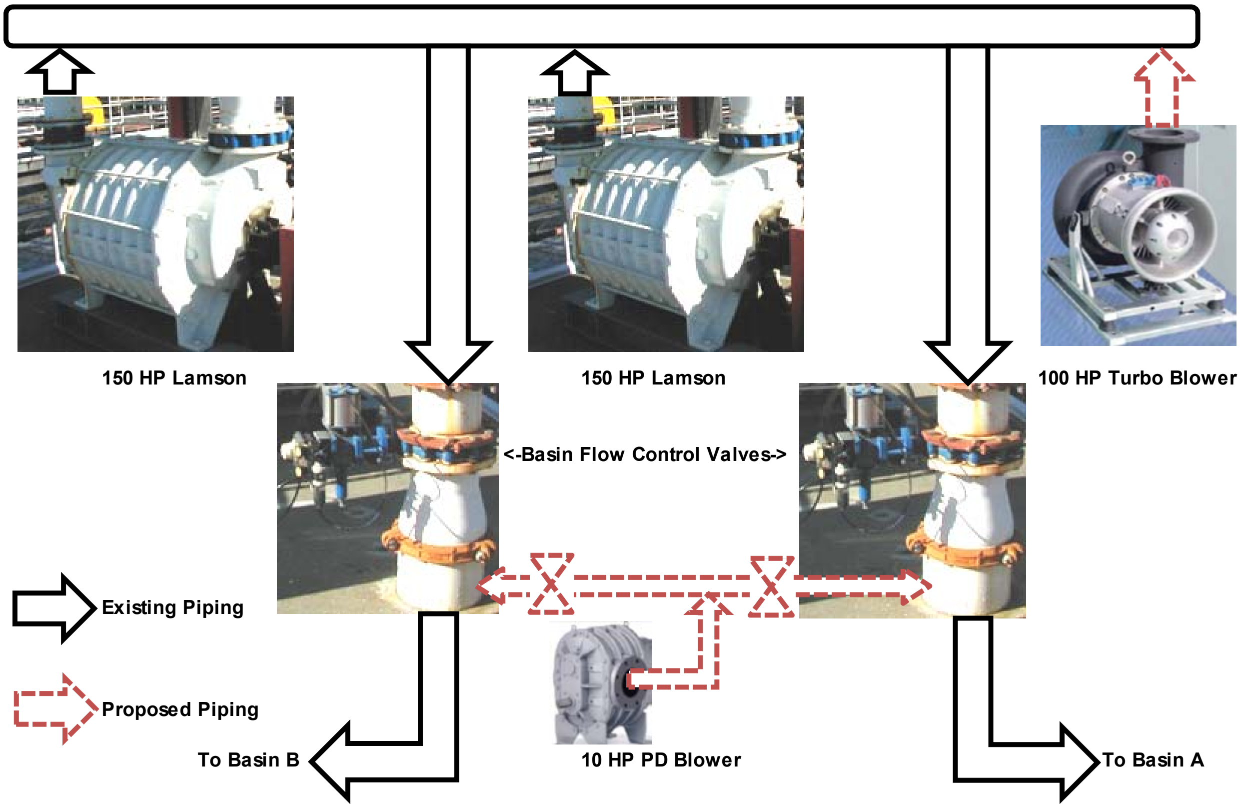
The majority of energy cost savings result from reducing energy (kWh) charges, not demand (KW) charges. However, we do anticipate a minor reduction in peak demand charges for the recommended retrofit, as reflected in Table 3.2.1.1. At the highest baseline process airflows, process air continued to be vented to the offline basin to supply its diffusers, adding to the total blower airflow, and peak power demand. This airflow will be supplied much more efficiently at low pressure if the low pressure blower recommendation is followed. The baseline maximum demand from the blower system was estimated at 169 KW, averaged over the year. The corresponding post retrofit demand estimate is 159 KW, the result of the 400 SCFM reduction in peak airflow for the main blowers, less the added demand of the proposed low pressure PD blower.

3.2.1.2 Scope of Effort to Improve Performance

A single high efficiency turbo blower was determined to be the most cost effective EEM for the process air supply. One of the existing Lamson multistage blowers would be replaced by a high efficiency blower capable of operation below 3000 SCFM. The new blower is expected to use the existing Lamson power supply with minimal modifications. Its controls will have to be integrated with the remaining Lamson blowers, allowing the turbo blower to operate at the lowest airflow demands, then using the Lamsons exclusively above the capacity of the turbo blower. For the occasional flow demands below the minimum of the turbo blower, excess air will need to be vented.

The low pressure air supply to the offline basin will require new piping to intercept the two existing basin air supply manifolds. Figure 3.2.1.2.1 shows the overall air supply schematic. The low pressure supply lines from the PD blower are expected to be 3” diameter, and could be tapped into the existing basin supply lines below the control and isolation valves. Manual valves would be included on each low pressure supply branch to direct the low pressure airflow to the offline basin.

Figure 3.2.1.2.1 – Schematic of Proposed Aeration Air Supply System

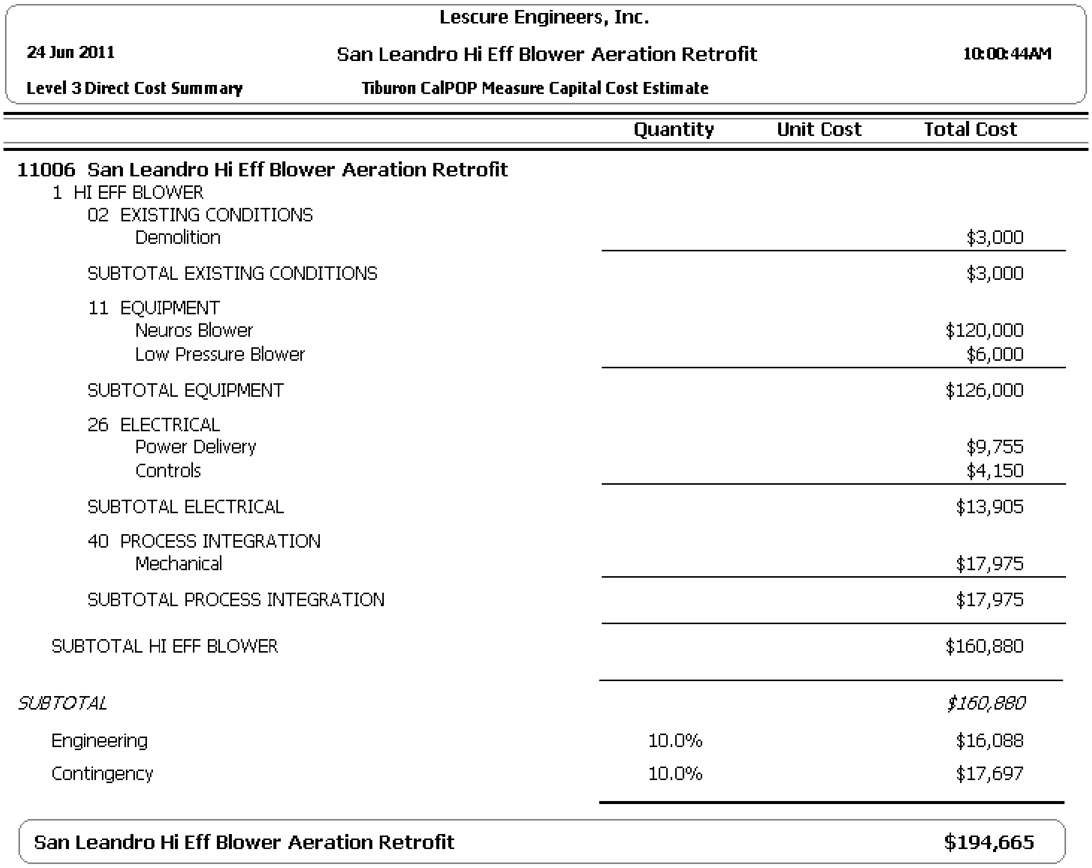


We also recommend the Lamson flow controls be reviewed, and if feasible, optimized for peak efficiency at the high airflow rates. As noted in the findings, it appears the suction valve on the Lamson blowers is currently used to restrict flow most of the time. This may be advantageous with the current configuration, but additional energy savings at higher air flows may be possible if the suction valves are optimized for the post retrofit operation.

We further recommend the airflow meters be calibrated prior to final design to verify their accuracy. While they appear to be reasonably accurate, post retrofit energy savings will be improved by accurately sizing the retrofit blower to handle the majority of airflow demands. Also, we recommend verifying pressure losses in the existing blower discharge piping, and estimating discharge losses in the retrofit piping, if substantial changes are made. If the assumptions of accurate airflow or the assumed 1 psig blower discharge friction losses are incorrect, the high efficiency retrofit blower should be optimized for the corrected airflow frequency distribution and/or anticipated discharge pressure range.

Table 3.2.1.2.1 summarizes the capital cost estimation for the retrofit. The largest single component is the turbo blower, which is based on a budgetary vendor quote. The San Leandro staff indicates they would prefer to perform the procurement and installation in-house, so no allowances have been made for bid quality construction documents or contractor margins.

Table 3.2.1.2.1 Capital Cost Summary for the Aeration Blower Retrofit Measure



Lescure Engineers, Inc.

24 Jun 2011 San Leandro Hi Eff Blower Aeration Retrofit 10:00:44AM

Level 3 Direct Cost Summary Tiburon CalPOP Measure Capital Cost Estimate

	Quantity	Unit Cost	Total Cost
11006 San Leandro Hi Eff Blower Aeration Retrofit			
1 HI EFF BLOWER			
02 EXISTING CONDITIONS			
Demolition			$3,000
SUBTOTAL EXISTING CONDITIONS			$3,000
11 EQUIPMENT			
Neuros Blower			$120,000
Low Pressure Blower			$6,000
SUBTOTAL EQUIPMENT			$126,000
26 ELECTRICAL			
Power Delivery			$9,755
Controls			$4,150
SUBTOTAL ELECTRICAL			$13,905
40 PROCESS INTEGRATION			
Mechanical			$17,975
SUBTOTAL PROCESS INTEGRATION			$17,975
SUBTOTAL HI EFF BLOWER			$160,880
SUBTOTAL			*$160,880*
Engineering	10.0%		$16,088
Contingency	10.0%		$17,697
San Leandro Hi Eff Blower Aeration Retrofit			**$194,665**

Table 3.2.1.2.2 summarizes the overall project costs, savings, and simple payback. This project would easily qualify for full funding with a California Energy Commission (CEC) loan. CEC loans have payment terms that allow the energy cost savings to pay off the loan. PG&E is now offering a loan package that also allows the energy savings to pay for the capital cost.

Table 3.2.1.2.2 – Economic Summary of Blower Automation and DO Control Measure

Description	**Amount**
Project Cost	$195,000
Total Annual Savings	$29,600
Simple Payback (years)	6.6
Energy Savings Rebate Estimate @$0.09/KWHr	$24,800
Demand Savings Rebate @ $100/KW Peak Summer Month	$1,000
Net Project Cost after Rebate	$169,200
Simple Payback (years) after Rebate	5.7

4. SAVINGS AND VERIFICATION PLAN

4.1 Energy Efficiency Projects

Project Level

When the program screening process results in an energy savings estimates at the project level, QuEST will use the following guidelines for determining the level of investigative thoroughness:

Option B: Verification for sites with anticipated savings between 200,000–800,000 kWh

QuEST will provide two weeks of metered data for both pre- and post conditions for the energy efficiency measures that are estimated to be contributing the greatest savings at a site where the estimated savings are between 200,000 and 800,000 kWh. QuEST will provide documentation to support the pre- and post implementation conditions.

Measure Level

When the program screening process results in energy savings estimates at the measure level QuEST will use the following guidelines:

Option B: For measures identified with a savings potential of 75,000 kWh and above

QuEST will provide two weeks of metered data for both pre- and post conditions and will provide documentation to support the pre- and post implementation conditions.

4.2 Retrofit Projects

QuEST will conduct a visual verification of the installation of all retrofit projects and will provide PG&E with digital pictures and invoices for all equipment.

5 CONTACTS, ROLES, AND RESPONSIBILITIES

Effective facility evaluation requires a team effort. The evaluation team for this project included the project owners, the owner’s project manager and operating staff, and the CalPOP Program staff. The team members and their contact information for this project are provided below:

Facility Management Staff	**Role**
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CalPOP Program Staff	
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6 PROJECT SCHEDULE

The proposed schedule for the recommended project is shown in the Table 6.1 below. With prompt approval and sufficient priority, the project should take one year to complete. Loan financing through the California Energy Commission or PG&E could be secured within the time frame indicated between project approval and equipment purchase.

Table 6.1 San Leandro Aeration Blowers Retrofit Proposed Schedule

Item Description	Date
Approve Project and Begin Design	August 2011
Receive Financing, Purchase Equipment	November 2011
Design Completion	December 2011
Receive Equipment	March 2012
Start Construction	April 2012
Construction Completion	May 2012
Commissioning Completion	June 2012
Energy Savings Verification	July 2012

APPENDIX A: MONITORING AND TRENDING PLAN DETAILS

1. Download hourly samples of the SCADA historical data for both basins: airflows and dissolved oxygen
2. Download hourly samples of the SCADA historical data for the blower system: electric current for all 3 blowers, and aeration air supply system pressure
3. Make spot measurements of power and current at all three blowers to establish the conversion for blower current measured in SCADA; Note the time and compare with the SCADA readings for current
4. Install one test quality pressure gauge (0-20 psig, +/- 0.2 psi) in the air supply manifold system pressure measurement point while the air flow is ramped across the normal operating range; Record the corresponding SCADA airflows to establish the air flow vs. pressure system curve

APPENDIX B: UTILITY RATES ANALYSIS

Electricity:

The following rates were downloaded from the PG&E website for schedule E-19P as current for June 2011.

Energy Charges E-19P		
Summer	Peak	$0.14581
	Part Peak	$0.10333
	Off Peak	$0.08611
Winter	Part Peak	$0.09345
	Off Peak	$0.08732

2011 Demand Charges per KW		
Summer	Max. Peak	$12.11
	Part Peak	$2.81
	Maximum	$9.27
Winter	Part Peak	$0.92
	Maximum	$8.07

These rates were applied to the monthly billings of the baseline usage period of calendar year 2010, using the following procedure:

1. The energy and demand rates are multiplied for each month by the actual account usage, and each month summed, so separate energy and demand costs are determined for the year.

2. When a seasonal TOU change occurs in a billing period (typically May 1 and November 1), proportion the energy usage according to the number of billing days in each TOU period.

3. The energy totals (kWh) and maximum demand averages (KW) are determined for the year.

4. A blended energy charge $/kWh is determined (which excludes demand charges).

5. A blended annual demand charge is determined ($/KW) based on the total of all demand charges for the year divided by the average maximum demand.

From these calculations, the following blended demand and energy charges were calculated for use in estimated electrical power cost savings:

Blended Energy Cost	**$**	**0.0996**	**/KWHr**
Blended Demand Cost	**$**	**209**	**/Yr/KW Avg. Max Demand**