# PUTTING A GOOD SPIN ON IT:

# EVALUATED BID PROCESS FOR CENTRIFUGAL DEWATERING SYSTEM

# REWARDS CITY AND MANUFACTURER

By


Phil Govea
Project Manager, Manteca Department of Public Works

Rachid Ait-Lasri
Assistant Engineer, Nolte Associates, Inc.

A. Graham Calciano
Associate Engineer, Nolte Associates, Inc.

Dave Richard
Director of Water Resources, Nolte Associates, Inc.

Blake Tresan
Assistant District Engineer, Truckee Sanitary District



Presented at the 2003 Annual
California Water Environment Association Conference
Ontario, California
April 22-25, 2003

# PUTTING A GOOD SPIN ON IT: EVALUATED BID PROCESS FOR CENTRIFUGAL DEWATERING SYSTEM REWARDS CITY AND MANUFACTURER

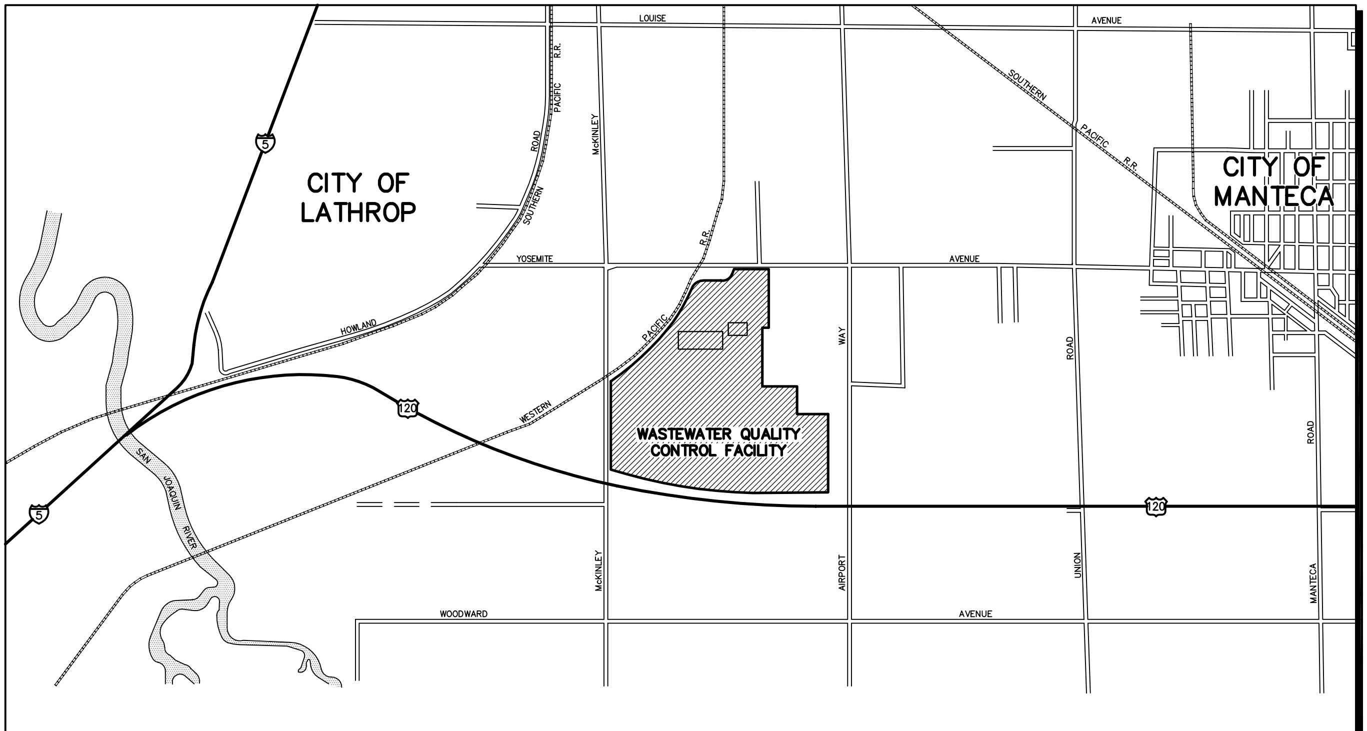
**By**
**Phil Govea**
**Rachid Ait-Lasri**
**A. Graham Calciano**
**Dave Richard**
**Blake Tresan**

**Abstract:** As part of a $40 million Phase III expansion and upgrade of the Manteca Wastewater Quality Control Facility (WQCF), the City of Manteca (City) will replace sludge drying beds with high-solids centrifuges. In this paper, an evaluated bid process for the procurement of a skid-mounted centrifuge dewatering system is described. A method for bid evaluation was developed to provide a fair assessment of competing $400,000 machines. In the bid document, base line performance requirements for cake solids, polymer dose, energy efficiency, and solids capture were identified along with economic impact of better or worse performance than these values. Manufacturers were required to guarantee performance equal to or better than the required minimum. If performance beyond the base line value was selected, the manufacturer was given credit by reducing their bid for evaluation purposes. This evaluated bid process rewarded the manufacturer with the best overall product for the City in terms of life cycle costs and performance characteristics while establishing subsequent conditions for field testing.

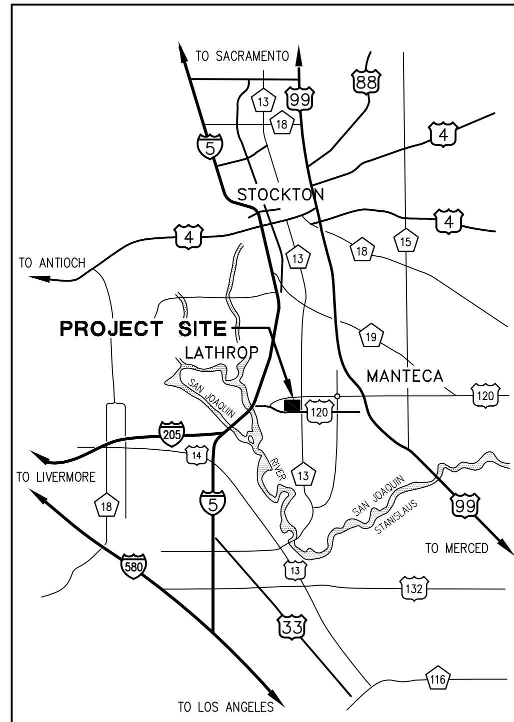
## Background

The Manteca WQCF is a 6.95 mgd combined biotower activated sludge secondary treatment plant. Secondary effluent is land applied during the summer and discharged to the San Joaquin River during the winter. The regional facility serves the communities of Lathrop and Manteca, south of the City of Stockton in Northern California (see Figure 1). The Manteca WQCF is scheduled for an expansion to a design capacity of 9.87 mgd beginning in 2003. In addition, the facility will be upgraded to achieve tertiary filtration and full nitrification. A description of the plant components, a discussion of current solids handling practices, and an inventory of proposed solids dewatering improvements are provided below.

**Description of Plant Components:** Currently, the Manteca WQCF consists of an influent pump station with two mechanical screens, two aerated grit tanks, three primary sedimentation basins, a biotower feed pump station, two biotowers, three fine-bubble activated sludge aeration basins, three secondary clarifiers, and two chlorine contact tanks (see site plan in Figure 2). Undisinfected secondary effluent is used to irrigate approximately 360 acres of City-owned and leased land surrounding the plant. Flows in excess of crop demands are disinfected and discharged to the San Joaquin River.




LOCATION MAP



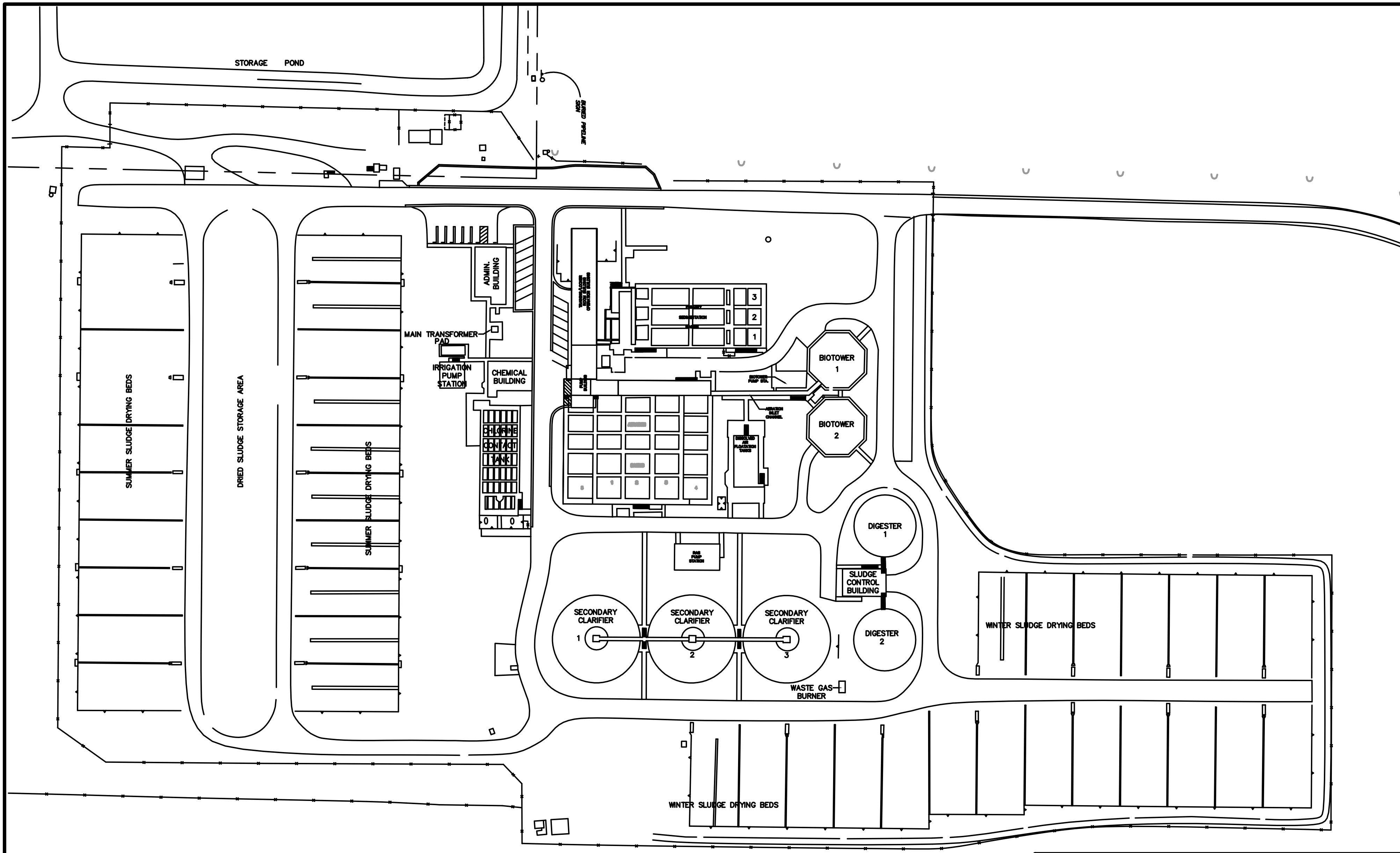

VICINITY MAP

## FIGURE 1

VICINITY–LOCATION MAPS

PUTTING A GOOD SPIN ON IT: EVALUATED BID PROCESS FOR CENTRIFUGAL DEWATERING SYSTEM REWARDS CITY AND MANUFACTURER

NOLTE
BEYOND ENGINEERING




# FIGURE 2

SITE PLAN

PUTTING A GOOD SPIN ON IT: EVALUATED BID PROCESS FOR CENTRIFUGAL DEWATERING SYSTEM REWARDS CITY AND MANUFACTURER

NOLTE
BEYOND ENGINEERING

In terms of solids handling, primary sludge is pumped directly to two anaerobic digesters. Waste activated sludge is thickened initially via dissolved air flotation thickeners then co-mingled with primary sludge prior to digestion. Anaerobically digested sludge is dried and stored on-site prior to land application. A process flow diagram for solids handling at the Manteca WQCF is presented in Figure 3. Solids handling practices are discussed further in the following section.

**Current Solids Handing Practices:** Primary sludge and thickened waste activated sludge are digested anaerobically prior to drying and beneficial reuse. Digested sludge is routed to 195,000 $ft^2$ of paved drying beds prior to stockpiling on-site. Grit and screenings are disposed offsite at a landfill. The existing air drying facilities consist of thirty-nine (39) drying beds, each measuring approximately 50 feet wide by 100 feet long. A typical drying bed has a sloped taper at the bed entrance, 2.5-inch asphalt pavement on a 6-inch aggregate base, an influent control valve, a sand drain in the center, and a slotted gate used for decanting excess liquid.

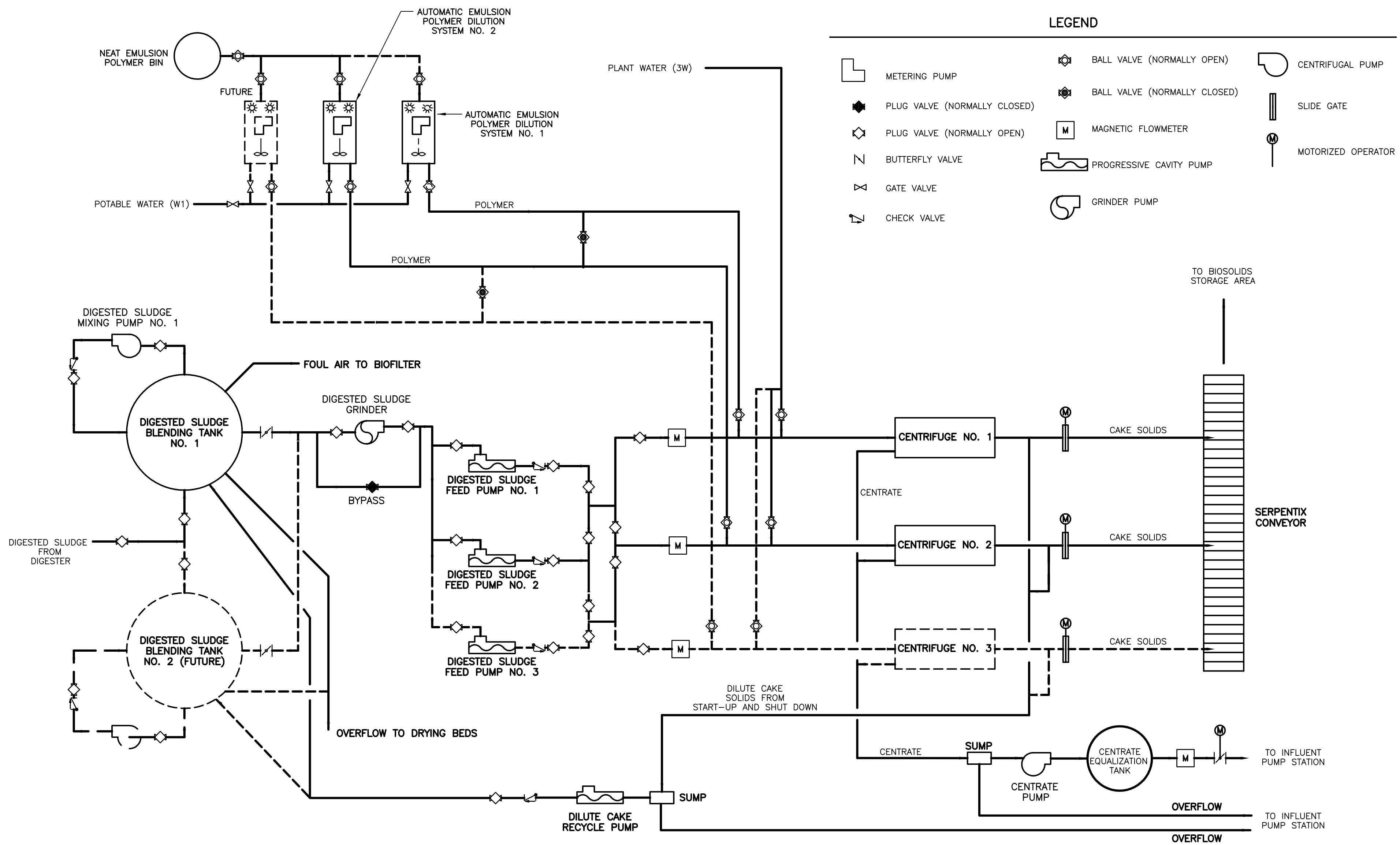
The drying beds are divided, based on their mode of operation, into the "summer" drying beds located south of the chlorine contact tank/chemical building, and the "winter" drying beds located north of the anaerobic digesters (see Figure 2). Half of the summer drying beds are configured as "double-size" drying beds measuring 100 feet by 100 feet. These beds were modified in an earlier project and do not have a sand drain in the center of the drying bed.

The drying beds are operated in two different modes reflecting the unfavorable drying conditions during the winter months. When the plant is operating in the winter, sludge is diverted to the winter drying beds. These beds are operated in a cascade mode. As the beds fill, liquid overflows and spills into the adjacent drying bed. This cascading operation continues throughout the season allowing the drying beds to accumulate with solids. Liquid that collects in the final drying bed of the cascading operation is removed from the drying bed by raising the slotted gate and redirected back to the head of the plant.

The summer drying beds are filled in a batch mode. These beds are allowed to sit for one week prior to removing water from the top of the bed by raising the slotted gate. The drying beds are stirred when a crust begins to form on the top of the solids. Mixing of the drying beds is needed to allow thorough drying to occur. The skin that forms on the surface of the solids must be broken to allow liquid to be exposed to the air. Plant experience indicates that the best mixing method involves driving over the drying beds. A Bobcat loader equipped with a specially fabricated boom is typically used to mix the drying beds.

Solids content following drying typically ranges from 20 to 50% following extensive working of the beds by plant staff. Beginning in the fall, dried solids are transferred to the stockpile area where they await land application. Solids leaving the stockpile area are further dried to a solids content of 75 – 90%. Currently one land application is performed each year in late December or early January on City property prior to agricultural operations.

Because of site constraints and winter operational concerns, alternatives to sludge drying beds were incorporated into the proposed expansion project. Several options were investigated initially including centrifuge and belt filter press dewatering. Plant staff indicated preference for centrifuge dewatering based on tours of several operating facilities in California and Nevada.




# FIGURE 3

SOLIDS HANDLING PROCESS FLOW DIAGRAM

PUTTING A GOOD SPIN ON IT: EVALUATED BID PROCESS FOR CENTRIFUGAL DEWATERING SYSTEM REWARDS CITY AND MANUFACTURER

NOLTE
BEYOND ENGINEERING

Based on input from the City, a new centrifuge dewatering building is planned for construction as part of an extensive series of solids handling improvements at the Manteca WQCF.

## Proposed Dewatering Facilities

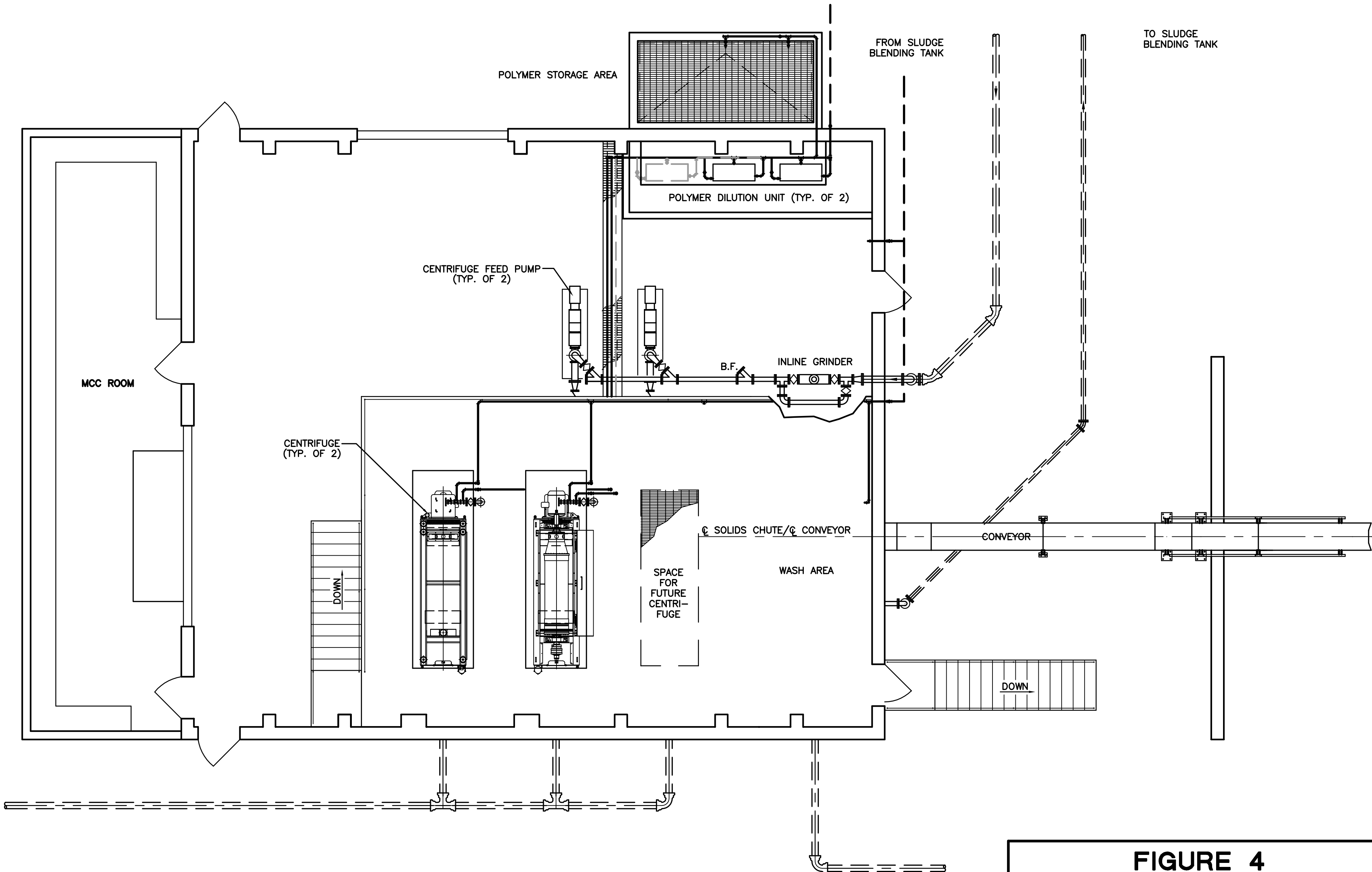
Design criteria for the proposed mechanical dewatering process is summarized in Table 1.

**TABLE 1**
**DESIGN CRITERIA FOR MECHANICAL DEWATERING PROCESS**
**MANTECA WQCF PHASE III EXPANSION PROJECT**

| Condition | Units | Value |
| --- | --- | --- |
| Source of feed sludge | -- | Anaerobically digested primary (70%) and secondary sludge (30%) |
| Solids concentration of sludge | % | 1.5 – 2.0 |
| Ash content of sludge feed | % | 50 |
| Feed sludge particle size not to exceed | in | 1.0 |
| Temperature of sludge feed | ºF | 60-98 |
| Number of centrifuges, duty | ea | 1 |
| Number of centrifuges, standby | ea | 1 |
| Design dry solids loading | lb/hr | 1,540 |
| Design flow rate | gpm | 185 |
| Maximum polymer consumption | lb/ton dry solids | 20 |
| Minimum solids capture | % | 90 |
| Minimum dewatered sludge cake solids concentration | % | 25 |

The Phase III design calls for construction of a dewatering building to house two 100-hp high solids centrifuges (one duty and one standby) with space for a third unit for future conditions. One of the two centrifuges would be pre-purchased as a skid-mounted system for later conversion to a fixed location. The two centrifuges will be mounted on a platform within the building. Digested sludge will be fed to the centrifuges via two progressive cavity pumps. To enhance the dewatering process, polymer will be injected into the sludge feed line. Polymer will be stored in 300-gal totes located on a concrete containment structure outside the dewatering building. The polymer will be diluted with potable water in one of two polymer dilution units. A layout of the building is included as Figure 4.

Dewatered cake from the centrifuges will be discharged at a solids content of approximately 25% onto a solids handling conveyor. The conveyor will discharge cake outside the building onto a biosolids composting and storage area. The discharge of the conveyor will be located at a height that can accommodate truck loading if the City elects to haul biosolids off-site at a future time. Each day, at centrifuge start-up and shut-down, the solids content of the sludge discharged through the solids chute will be too low to transfer on the conveyor. During these periods, a motorized slide gate, will close and divert the dilute solids stream through a flexible hose to a




# FIGURE 4

DEWATERING BUILDING LAYOUT

PUTTING A GOOD SPIN ON IT: EVALUATED BID PROCESS FOR CENTRIFUGAL DEWATERING SYSTEM REWARDS CITY AND MANUFACTURER

NOLTE
BEYOND ENGINEERING

sump located in the dewatering building. This dilute stream will be pumped back to an equalization tank for reprocessing. A vertical progressive cavity pump will be used for pumping the dilute stream. The sump will also include an emergency overflow line in the event the pump is not operational. The overflow line will convey dilute solids to a sanitary sewer manhole upstream of the influent pump station.

The centrifuges will be operated Monday through Friday approximately 10 hr/day. To store digester effluent generated during the weekends and non-working weekday hours, construction of an equalization tank is required. The size of the equalization tank was based on the need to store digested sludge from 5:00 p.m. on Friday to 8:00 a.m. on Monday or 63 hours. At the projected Phase III sludge generation rate of approximately 80,000 gal/day, the equalization tank requires a volume of 210,000 gal. An additional 15 percent storage volume was provided as a factor of safety bringing the size of the equalization tank to 240,000 gal. Space for a second equalization tank of equal size is set aside for a future expansion.

The equalization tank is equipped with a mixing system to maintain homogeneity of the sludge. The efficiency of the centrifuge is improved when the sludge feed is consistent in nature. The mixing system consists of a 20-hp screw centrifugal pump that draws sludge from the bottom of the tank and reinjects it through three nozzles located along the perimeter. The equalization tank will also be constructed with an emergency overflow. The overflow will direct sludge to either one of the remaining sludge drying beds or the influent pump station.

Centrifuge centrate (the liquid discharge) will flow by gravity to a centrate equalization transfer structure located adjacent to the dewatering building. From the transfer structure, the centrate will be discharged to a centrate equalization tank. The centrate equalization tank will be located in one of the two existing chlorine contact tanks. The chlorine contact tanks will no longer be in use. Each chlorine contact tank has a volume of approximately 170,000 gal, providing sufficient volume to provide complete equalization of the centrate. The second chlorine contact tank will be used to meet future conditions.

The purpose of the centrate equalization tank is to reduce shock loading of centrate to the influent pump station. Based on historical laboratory analyses of the decant from the existing sludge drying beds, it is estimated that the centrate will have a TKN concentration that ranges from 600 to 1,000 mg/L. At this concentration, if no equalization were provided, the centrate would result in almost a 100 percent increase in the incoming nitrogen loading to the plant. This shock loading would make consistent operation of the secondary biological treatment system difficult. With equalization, the centrate will be released back to the influent pump station at a constant rate minimizing potential shock loading.

**Alternative Centrifugal Dewatering Systems**

Based on an initial review of potential centrifuge suppliers, an assessment of operational histories for similar-size units, and a series of site visits to facilities in Northern California, Southern California, and Nevada, a "short-list" of prequalified vendors was established. A description of the units proposed by Alfa-Laval, Andritz-Ruthner, and Centrisys is provided below including a partial list of operational facilities. A summary of equipment characteristics is provided in Table 2.

**TABLE 2**
**SUMMARY OF PREQUALIFIED CENTRIFUGAL DEWATERING SYSTEMS**
**MANTECA WQCF PHASE III EXPANSION PROJECT**

| Item | Alfa Laval | Andritz-Ruthner, Inc. | Centrisys |
|---|---|---|---|
| Model Number | ALDEC 556 | D5LL | CS21-4 |
| Diameter (Inches) | 18.9 | 20.5 | 21 |
| Bowl Length (Inches) | 80 | 102 | 90 |
| Minimum Bowl Thickness (Inches) | 0.49 | 0.9 | 0.7 |
| Bowl construction | Centrifugally cast | Statically cast | Centrifugally cast |
| Scroll Conveyor | | Tungsten carbide tip | |
| Front Hub Thickness | 2.17 | 2.28 | - |
| Rear Hub Thickness | 1.1 | 3.9 | - |
| Bearings | Grease lubricated, ball or cylindrical roller type | External grease lube ball at rear end, cylindrical at front end | Oil lube roller bearings in one piece pillow blocks |
| Operating Speed (rpm) | 3,650 | 3,200 | 3,150 |
| Force (G) | 3,574 | 2,976 | 3,000 |
| Overall Length (Inches) | 480 | 180 | 222 |
| Overall Width (Inches) | 96 | 52 | 88 |
| Overall Height (Inches) | 96 | 62 | 110 |
| Main Drive System (HP) | 100 | 100 | 75 |
| Secondary Drive Motor (HP) | [a] | 20[a] | 15[b] |
| Gearbox | Two-stage planetary gear reducer | Single-stage cyclo speed inducer | |

[a] Variable frequency drive
[b] Hydraulically-driven

**Alfa Laval:** The unit proposed for Manteca was the ALDEC 556. The Alfa Laval bowl drive system consists of 100 hp electric motor and a belt drive system. The belt drive system is comprised of multiple belts to provide full load capacity and also to withstand the full starting torque of the system. The backdrive system controls the rate at which the scroll rotates and moves solids towards the solids discharge end. The Alfa Laval backdrive system provides an infinite speed variation for the scroll conveyor of 1 to 20 rpm. To achieve the speed variation the scroll conveyor is VFD driven. The main drive motor and the backdrive motor are located at opposite ends of the centrifuge. These units have proven to be highly efficient and are currently in service at the City of Las Vegas, City of Billings, and Santa Fe Valley WRP.

**Andritz-Ruthner:** To meet the proposed solids loading, a D5LL unit was recommended. For this centrifuge, a 100 hp main drive motor powers the bowl drive system with a V-belt drive. The centrifuge is equipped with a backdrive system that allows the adjustment of the differential speed between the centrifuge bowl and conveyor during operation. The backdrive system utilizes an AC/VFD 20 hp motor. Unlike Alfa Laval, the backdrive motor is located above the main drive motor on the same end of the centrifuge. Andritz-Ruthner centrifuges are currently in service at the Carson City WWTP and the Tahoe-Truckee Regional WWTP.

**Centrisys:** Based upon their experience at the Manteca WQCF, Centrisys proposed their CS21-4 unit. For this centrifuge, a 75 hp main drive motor powers the bowl drive system with a V-belt drive. The scroll conveyer is designed to be powered by 15-HP, water cooled hydraulic system. The hydraulic system eliminates mechanical connections between the motor and backdrive system. Similar to the Alfa Laval system, the main drive motor and the hydraulic backdrive are located at opposite ends of the centrifuge. This Centrisys centrifuge is currently in service at the City of Daly City and the City of Blackfoot (Idaho).

**Plant Operational Experience with Centrifugal Dewatering Systems**

To confirm proposed design loading while providing hands-on operational experience with mechanical dewatering, two major activities were undertaken by the City. A pilot test was arranged with one centrifuge supplier and later a long-term lease was executed with a second supplier. The results of each activity are summarized below:

**Pilot Testing**

To evaluate the performance capabilities of a decanter centrifuge, a pilot test was performed by Andritz-Ruthner at the Manteca WQCF from May 12-16, 1997. For the purposes of this test, Andritz-Ruthner provided a trailer-mounted D4L centrifuge and technicians for the operation. The primary objectives of the testing were to determine:

1. Achievable cake dryness at various throughputs.
2. Solids capture rates at various throughputs.
3. Polymer dosage rates for optimum performance.

Pilot test results revealed the following:

1. At a feed concentration of 1.75% total suspended solids (TSS) and throughputs of 40-100 gpm, dewatered cake produced ranged from 21-33% TSS. At a solids loading rate of 600 lb/hr, a dewatered cake content of 26% TSS was achieved.

2. Solids capture ranged from 72.7-99.2% during the pilot test. A solids capture of 92% was obtained at a solids loading rate of 600 lb/hr.

3. Active polymer dosages ranged from 12.9-29.2 lbs/ton dry solids. An active polymer dose of 18-20 lbs/ton dry solids produced 26% cake solids with 92% recovery.

**Leasing of Centrifuge:** As the next step in the implementation of the mechanical dewatering program, the City initiated a leasing arrangement with Centrisys for a skid-mounted high solids decanter. Leasing of a centrifuge was viewed as a short-term measure to mitigate on-going capacity problems with the existing sludge drying beds while further developing performance data for a full-scale facility. The terms of the lease for the Centrisys unit (Model CS18-4) included a monthly payment of $12,500 in exchange for the unit, 24 hours of on-site technical assistance per month, and bi-weekly inspections. Unit performance is summarized in Table 3. For digested sludge feed concentrations between 1-2% solids, dewatered cake solids concentrations from 20-26% were achieved.

**TABLE 3**
**SUMMARY OF CENTRIFUGE OPERATING PERFORMANCE**
**FEBRUARY – MAY 2002**
**CENTRISYS MODEL C518-4**
**MANTECA WQCF**

| Parameter | Value |
|---|---|
| Feed sludge solids concentration | 1.3-2.45% |
| Sludge feed rate | 70-85 gpm |
| Solids loading | 480-980 lb/hr |
| Polymer consumption | 9.5-19.6 lb/dry ton |
| Dewatered cake solids concentration | 20-26% |

**Development of Evaluated Bid Documents**

As noted earlier, the following centrifuge manufacturers were pre-qualified to bid on a skid-mounted centrifuge system: Alfa-Laval, Andritz-Ruthner, and Centrisys. Each supplier was allowed to bid their standard machine packages, control system, and ancillary equipment. The technical specifications for the procurement documents identified conditions of service and performance requirements. These requirements were established based on previous pilot testing, operational performance of leased units, and input from the respective suppliers. In the bid form, each manufacturer was required to guarantee the performance of their machine with respect to the following base line parameters:

1. Solids dewatering: 25% solids minimum content of cake
2. Polymer: 20 lb of polymer maximum per ton of cake produced
3. Power consumption: 0.4 hp per gpm maximum
4. Solids capture: 95% capture minimum

Considering these base line values, the basis for the evaluated bid is described below.

**Rationale:** If the manufacturer listed a performance better than the "base line" value, their lump sum bid was adjusted. A centrifuge manufacturer whose machine is able to perform better than the design requirements would be rewarded during the bid evaluation. Specifically, for superior performance, the lump sum bid would be evaluated (adjusted) downward creating a competitive advantage for the supplier.

The calculation of credits or performance penalties was based upon the following assumptions:

1. Savings would accrue over a 10 year operational period.

2. Return rate of 8% would be used to compute present worth savings.

3. Machines would operate at a hydraulic loading of 185 gpm.

4. Solids feed concentration of 1.7% is anticipated.

5. Machine operation would be 5 day/wk, 8 hr/d.

Specific credits for superior performance are detailed as follows:

**Cake Solids:** Dewatered cake is currently applied to land surrounding the Manteca WQCF. In the future, this material may be hauled to a landfill for disposal. Disposal costs are based on the weight of the material. The base line solids content requirement is 25%. Deviation from the base line solids content will result in the following costs/savings:

<u>Given</u>

1. Base line cake solids = 25%

2. Disposal cost of cake = $15/wet ton (based on haul and tip at landfill)

<u>Calculate savings for 1% change in cake solids:</u>

1. Annual cake generated = 1,540 dry lb/hr x 8 hr/d x 260 d/yr x ton/2,000 lb
   = 1,600 dry ton/yr

2. Disposal cost at 25% = (1,600 dry ton/yr)/25% = 6,400 wet ton/yr x $15/wet ton
   = $96,000/yr

3. Disposal cost at 26% = (1,600 dry ton/yr)/26% = 6,153 wet ton/yr x $15/wet ton
   = $92,300/yr

4. Cost difference = $96,000 - $92,300 = $3,700/yr

5. Over 10 years, cost difference = $3,700/yr x 10 yr = $37,000

6. In present dollars = Present worth factor (10 years, 8% return rate) x $37,000
   = 0.67 x $37,000 = $25,000

Therefore, a 1% increase in cake solids produced from the centrifuge, will save $25,000.

**Polymer Use:** Centrifugal dewatering requires the addition of polymer to the sludge. The baseline amount of polymer that can be used per ton of dry cake produced is 20 lb/dry ton.

Deviation from the base line amount of the polymer use will result in the following costs/savings:

Given

1. Base line polymer use = 20 lb active polymer/dry ton of cake produced

2. Polymer cost = $1/lb

Calculate savings for 1 lb/dry ton change in polymer used:

1. Base line cost = 1,600 dry ton/yr x 20 lb polymer/dry ton x $1/lb = $32,000/yr

2. Cost difference of 1 lb/dry ton difference in polymer requirement
   = 1,600 dry ton/yr x 21 lb polymer/dry ton x $1/lb
   = $33,600/yr

3. Cost difference = $33,600/yr - $32,000/yr = $1,600/yr

4. Over 10 years, cost difference = $1,600 x 10 years = $16,000

5. In present dollars = Present worth factor (10 years, 8% return rate) x $16,000
   = 0.67 x $16,000 = $11,000.

Therefore, a change of 1 lb of polymer per dry ton of cake solids produced, will save $11,000.

**Energy Use:** Centrifuges are energy intensive machines. Manufacturer's centrifuges are required to meet a specific energy efficiency. There is a cost/saving associated with improved energy efficiency as calculated below:

Given

1. Base line energy efficiency = 0.4 hp/gpm

2. Horsepower is the combined demand of the bowl and scroll motors.

3. Electricity cost = $0.10/kWh

Calculate savings for 0.1 hp/gpm change in centrifuge energy demand:

1. Energy cost = 0.4 hp/gpm x 0.746 kW/hp x $0.10/kWhr = $0.03/gpm-hr

2. Base line cost = $0.03/gpm-hr x 185 gpm x 8 hr/d x 260 d/yr = $11,500/yr

3. Cost of 0.1 hp/gpm energy use = 0.5 hp/gpm x 0.746 kW/hp x $0.10/kW/hp x 185 gpm x 8 hr/d x 260 d/yr = $14,430/yr

4. Cost difference = $14,430/yr - $11,500/yr = $3,000/yr

5. Over 10 years, cost difference = $3,000 x 10 = $30,000

6. In present dollars = Present worth factor (10 years, 8% return rate) x $30,000
   = 0.67 x $30,000 = $18,800.

Therefore, for every change of 0.1 hp/gpm in energy efficiency of the centrifuge, a savings of $18,800 is realized.

**Solids Capture:** There is a cost associated with having to re-process solids that pass through the centrifuge and are routed to the treatment plant headworks. One approach to estimating this cost is to consider the cost of the proposed solids handling improvements and to pro-rate these costs as a function of solids loading. This calculation is illustrated as follows:

<u>Given</u>

1. Base line capture rate = 95%

2. Projected cost of solids handling improvements = $10,000,000

3. Solids concentration of raw wastewater = 315 mg/L

4. Incremental increase in wastewater design flow = 3 mgd (7 mgd to 10 mgd)

5. Solids loading from 3 mgd = 3 x 315 x 8.34 = 7,880 lb/d = 1,438 ton/yr

6. Solids input to centrifuge = 1,600 ton/yr

<u>Calculate a 1% change in solids capture:</u>

One percent of solids loading to centrifuge:

1. 1,600 dry tons x 0.01 = 16 dry tons/yr

2. Solids loading associated with incremental expansion = 3 mgd/10 mgd x 16 ton/yr
   = 4.8 ton/yr

3. Pro-rated cost of solids handling improvements = 4.8/1,438 ton/yr x $10 million = $30,000

Therefore, a 1% change in solids capture is equivalent to $30,000 in savings associated with the proposed expansion/upgrade project.

**Results of Evaluated Bid Process**

As detailed previously, in addition to the equipment price submitted by the pre-qualified centrifuge suppliers, four additional parameters were evaluated by the City. These parameters are summarized in Table 4. The referenced parameters also represent specific performance penalties should the proposed requirements listed by the vendors not be achieved.

**TABLE 4**
**PARAMETERS USED IN EVALUATED BID FOR**
**HIGH-SOLIDS CENTRIFUGE SYSTEM**
**MANTECA WQCF PHASE III EXPANSION PROJECT**

| Parameter | Base Line Requirements | Bid Adjustment |
|---|---|---|
| Cake Solids | Minimum 25% | $25,000 per 1.0% increase in cake solids |
| Polymer Use | Maximum 20lb/dry ton solids | $11,000 per lb/dry ton decrease in polymer use |
| Energy Use | Maximum 0.4hp/gpm | $18,800 per 0.1 hp/gpm decrease in energy use |
| Solids Capture | Minimum 95% | $30,000 per 1.0% increase in solids capture |

The three pre-qualified centrifuge suppliers submitted bids to the City in September 2002. Bid results are summarized in Table 5. Equipment costs were divided into two categories: high-solids centrifuge and all ancillary equipment/controls. Because the successful supplier would also likely receive an order for a future second centrifuge, the price bid for the initial centrifuge would also apply to a second unit if purchased within 12 months. In this manner, the City could be assured of a “fair and equitable” price for a future sole-source equipment item.

**TABLE 5**
**SUMMARY OF EVALUATED BID RESULTS**
**SKID-MOUNTED DEWATERING SYSTEM PROCUREMENT**
**MANTECA WQCF PHASE III EXPANSION PROJECT**

| Item | Alfa Laval | Andritz-Ruthner, Inc. | Centrisys |
|---|---|---|---|
| Centrifuge and Controls | 287,000 | 278,500 | 258,300 |
| Ancillary Components | 199,000 | 130,500 | 86,500 |
| Subtotal | 486,000 | 409,000 | 344,800 |
| Sales Tax @ 7.75% | 37,665 | 31,698 | 26,722 |
| **Total Base Bid** | **$523,665** | **$440,698** | **$371,522** |
| Bid Adjustments for Solids Content of Cake | | | |
| Guaranteed Solids Content, % | 26 | 25 | 29 |
| Bid Adjustment | 25,000 | 0 | 100,000 |
| Bid Adjustment for Amount of Polymer Use | | | |
| Guaranteed Polymer Use, lb/dry ton | 23 | 25 | 25 |
| Bid Adjustment | 22,000 | 0 | 0 |
| Bid Adjustment for Energy Efficiency | | | |
| Guaranteed Unit Energy Use, hp/gpm | 0.3446 | 0.3500 | 0.4000 |
| Bid Adjustment for Improvement Efficiency | 10,415 | 9,400 | 0 |
| Bid Adjustment for Solids Capture Guaranteed | | | |
| Solids Capture, % | 95 | 97 | 97 |
| Bid Adjustment for Improved Solids Capture | 0 | 60,000 | 60,000 |
| **Total Bid Adjustments** | **<$ 57,415>** | **<$69,400>** | **<$160,000>** |
| **Adjusted Total Base Bid** | **$466,250** | **$371,298** | **$211,522** |

Based on the results of the evaluated bid process, Centrisys was selected to supply the skid-mounted dewatering system.

## Anticipated Schedule

The City awarded the procurement contract to Centrisys in October 2002. Shop drawings have been approved and the dewatering system is currently under fabrication. The skid-mounted unit and ancillary equipment is expected on-site in July 2003 for performance testing. The centrifuge is scheduled for extensive use in the fall and winter of 2003 as large areas of plant sludge drying beds are demolished and converted to new treatment facilities. Installation of the centrifuge in a permanent dewatering building is planned in the summer of 2004.

## Conclusions

There are a number of high-solids centrifuges available that can consistently produce dewatered cake in the 25-30% solids range. Because units differ in features, controls and components, selection becomes difficult for an agency. Considering the relative first cost of a centrifugal dewatering system, formal analysis of future operating costs during the bidding process is warranted. The use of an evaluated bid format that combines first costs with adjustments for superior machine performance is an effective procedure for ensuring the selection of the most cost-effective centrifuge.