APPENDIX B

SELECTED VENDOR DATA

PASSAVANT

EQUIPMENT RECOMMENDATION
FOR
COMMONWEALTH OF PENNSYLVANIA

FILTRATION EQUIPMENT

One(1)	Pressure Filter Model 15, complete with 145 Ductile Iron Filter Plates, Hydraulic power Pack, Light Curtains, Automatic Plate Shifter, and Core Blow System.
One(1)	Filtrate Weir Tank
Two(2)	Model 3800-18 Filter Feed Pumps, complete with Hydraulic Power Pack and Surge Tank.
One(1)	Fast Fill Pump, 2000 gpm each.
One(1)	Air Compressor 55 cfm @ 200 psi, complete with 240 gallon receiver
One (l)	Lot of Automatic Valves
One (l)	Master Control Panel, Semi-Automatic, Non-graphic

The estimated budget price for the above equipment is $580,000.00
F.O.B. Birmingham, Alabama.

PASSAVANT

ESTIMATED ELECTRICAL REQUIREMENTS

ITEM	NO. UNITS	HP	TOTAL HP	ON TIME MIN/CYCLE	HP-HRS/ DAY
PLATE SHIFTER	1	1½	1½	3	1.20
FILTER POWER PACK	1	7½	7½	12½	25.00
PISTON PUMP	2	50	100	38	1013.33
FAST FILL PUMP	1	150	150	2	80.00
AIR COMPRESSOR	1	15	15	20	80.00
TOTAL CONNECTED HORSEPOWER:		274 HP		Total Hp-Hrs/Day:	1199.53

UTILIZATION: Assume 70% (Conversion to brake horsepower)

1159.33 hp-hr/day x 0.70 = 840 bhp-hr/day

HORSEPOWER CONVERSION:

840 bhp-hr/day x 0.7457 kw/hp = 626 kwh/day

POWER REQUIREMENT PER TON OF SLUDGE DRY SOLIDS:

616 kwh per day / 20.64 tons per day = 31 kwh per ton of dry solids

*Standby Not Included
**16 Hr/Day Operation

OUTSIDE UTILITY REQUIREMENTS

Outside utility requirements for the Solids Disposal equipment, as outlined by PASSAVANT CORPORATION, consist of power, water and compressed air.

Power requirements are outlined in another section of this report entitled "Electrical Requirements/Motor Horsepower Requirements".

Water requirements are estimated at 20 gpm based upon 10 gpm requirement for each in-service power pack serving the piston-type filter feed pumps.

Compressed air requirements are serviceable by a 240 gallon air storage tank at 200 psig, for the filter power pack and pneumatic valving equipment, outlined by PASSAVANT CORPORATION. The compressed air system is included in the estimate for the basic equipment system.

PASSAVANT

COST ESTIMATES

FOR

COMMONWEALTH OF PENNSYLVANIA

ESTIMATED CAPITAL COSTS	
FILTRATION EQUIPMENT	$580,000
INSTALLATION (ALL EQUIPMENT)	$100,000
ESTIMATED OPERATING COST	
POWER, KWH/TON D.S.S.	31
LABOR, MAN-HOURS/SHIFT	3
ESTIMATED MAINTENANCE COST	
$/YR	$15,000
UTILITY REQUIREMENTS	
COOLING WATER AND SEAL WATER:	20 gpm

BIRD MACHINE COMPANY, INC., SO. WALPOLE, MASS. 02071
PHONE: 617 668-0400 / TELEX: 92 4428 / CABLE: BIRDMACHIN SOWALPOLEMASS

November 27, 1979

L. Robert Kimball & Assoc.
615 West Highland Avenue
Ebensburg, Pa. 15931

Attention: Mr. Roland A. Kohlbeck, P.E.

Gentlemen:

We are pleased to offer our unique sludge dewatering centrifuges for your AMD neutralization sludge. A 3% sludge at 165,000 G.P.D.or 115 G.P.M. could easily be handled by our HB-3900 which is 14-ft. long, 4 ft. high, and 8 ft. wide and weighs 15,000 lbs. We have observed a substantial variation from one sludge to another, but would not consider 20% solids to be a particularly difficult requirement.

Capital cost of the machine, including shipping, start-up, polymer system, etc., but not including installation cost, would be about $185,000 this year and would increase about 10% per year. Amortization, of course, depends on the interest rate chosen.

O&M Costs would consist of electric power (40-50 H.P. continuous), polymer coagulant (about $8,000 per year at $1.35/lb.), routine maintenance ($1,500/yr. parts plus 200 hr./yr. labor for repairs, lubrication, etc.) and some operator attention. If the centrifuge is run continuously, operator attention would be limited to twice per shift observation to verify proper operation. This should require a total of 1 hr./day for three shifts. If a regular control room already exists, a "fault panel" could be added to that room and actual physical observation of the machine would not be required. Remote control operation would add about $5,000 to the capital cost.

Attached is a sample specification for our machine. If you need further information, please do not hesitate to call me or Mr. Neil Policow of our Pittsburgh Office (412) 367-2425.

Very truly yours,

BIRD MACHINE COMPANY, INC.

Glenn Reierstad

G. A. Reierstad
Product Manager
Process Equipment Division

Kohlbeck

GAR:md
Enclosure

CENTRIFUGE SPECIFICATION

I The centrifuge shall be designed specifically for dewatering wastewater sludges and shall be provided with features shown to be cost effective for this service.

II Capacity requirement is 165,000 gallons per day at 3% average suspended solids. Centrifuge and all appurtenances shall be sized to have at least 20% excess capacity to deal with upset conditions or to "catch up" after periods of outage.

III The centrifuge shall consist of a horizontal cylinder-conical solid bowl in which a scroll conveyor fits concentrically. Bowl shall be a minimum of 24-inch diameter (600 mm) and 96-inch length (2400 mm) and shall be of steel, stainless steel and/or ceramic construction. Conveyor shall be of steel construction, protected from erosion and corrosion by ceramic or tungsten carbide hardfacing elements and manufacturer's standard corrosion-resistant paint. Bowl shall be supported by spherical roller bearings with a B-10 life of 100,000 hours or more. Conveyor shall be supported by self-lubricated bushings or grease lubricated bearings protected by mechanical seals against contamination. Differential speed between bowl and conveyor shall be effected by a combination of heavy-duty, two-stage, planetary gear box and an electrical or hydraulic variable speed pinion drive. Positive torque overload protection with manual reset shall be provided and shall be interlocked with sludge feed system to prevent the feeding of sludge to an overloaded machine.

IV Centrifuge drive shall be by squirrel cage induction motor and fluid coupling to minimize inrush current. Motor shall be not greater than 75 H.P. and coupling shall be designed to limit inrush current to not more than 175 Amp.

V Polymer addition system shall consist of two 1500 gallon plastic or stainless steel tanks, each equipped with low-speed mechanical agitator, polymer addition eductor, stainless steel metering pump, in-line dilution eductor, in-line static mixer and dilution rate rotometer. Design rate shall be two pounds per hour dry polymer (each) at a final concentration of 0.1% by weight with a turndown of 10:1, giving a minimum rate of 0.2 Lbs./hr at a final concentration of 0.1%.

VI Manufacturer shall supply a "fault panel" incorporating lights to indicate any faults which could cause shutdown of the equipment. In addition, panel shall incorporate start/stop buttons for centrifuge, feed pump, polymer addition and remote readout of feed and polymer pump rates. Panel shall be of NEMA4 construction and shall contain provision for remote fault annunciator, to be supplied by others.

Envirex
a Rexnord Company

P. O. Box 1067
Waukesha, WI 53187
1901 South Prairie Avenue
414/547-0141

December 3, 1979

L. Robert Kimball & Associates
615 W. Highland Avenue
Ebensburg, PA 15931

Attention: Mr. Roland Kohlbeck
Vice President Environmental

Subject: Carl White Water Reclamation Plant
Ernest Mines
Indiana County, PA

Dear Mr. Kohlbeck:

Confirming our conversation of last week, based upon our laboratory test on the singular sample that we had received and a dry solids loading of 39,000 lb/day to the dewatering system, we would recommend one 45 ft. diameter gravity thickener and four one-meter belt filter presses for the dewatering of this sludge. The mechanism for the gravity thickener would be approximately $40,000 (tank by others), and the four belt press mechanisms would be approximately $240,000. The gravity thickener mechanism would be driven by a 2-3 HP motor and each belt press mechanism would be driven by a 5 HP motor. One operator would be required per shift to perform routine maintenance, clean-up, monitoring, etc.

RXN-DRUM INCL

As an alternative, two (2) 12 ft. diameter x 24 ft. long vacuum filters would be required to perform the same task. The vacuum filters would sell for about $475,000 and would require the following for operation (included in the price).

Vacuum Pump - 200 HP
Filtrate Pump - 15 HP
Drum Drive - 5 HP
Discharge Roll Drive - 1½ HP
Agitator Drive - 3 HP

PROVISIONS FOR ½ HP

Once again, one operator per shift would be required to perform the aforementioned tasks.

If you have any questions or require any additional information, do not hesitate to contact our sales engineer in your area, Mr. James Riddell, at (412)563-2245, or myself.

Sincerely,
John A. Cimermancic
John A. Cimermancic
Industrial Project Engineer

Kohlbeck

Envirex
a Rexnord Company

NOV 9 1979

P. O. Box 1067
Waukesha, WI 53187
1901 South Prairie Avenue
414/547-0141

November 7, 1979

L. Robert Kimball & Associates
615 W. Highland Avenue
Ebensburg, PA 15931

Attention: Mr. Roland Kohlbeck, Vice President Environmental

Subject: Sludge Dewatering Tests
Acid Mine Drainage Sludge

Dear Mr. Kohlbeck:

This letter is being sent to report on the results of the sludge dewatering tests that had been conducted in our laboratory on the aforementioned sludge. Characteristics were as follows:

INFLUENT SLUDGE:

Suspended Solids = 14,200 mg/l
pH = 7.8

VACUMM FILTER TESTS:

Media- Ametek XBH- x4M7-8D9
Polyester Drum Submergence - 37 1/2%

CYCLE TIME	CAKE DEPTH	YIELD	CAKE SOLIDS
3 Min.	1/8"	1.4 lb/Hr/Ft^2	10%
4 Min.	1/8"	1.3 lb/Hr/Ft^2	10%
5 Min.	1/8"	1.1 lb/Hr/Ft^2	10%
6 Min.	3/16"	1.0 lb/Hr/Ft^2	10%

Filtrate Volume - .15 GPM/Ft^2

Comments- All excellent cake discharges; influent slurry appeared to be "too thin" for vacuum filtration to be feasable which later was proven wrong;

RKolbeck

gravity thickening of sludge would most probably increase yields substantially (2 to 3 times) to bring the yield more in line with other calcium sulphate type sludges of this nature.

If you have any questions or require any additional information do not hesitate to contact our sales enginner in your area, Mr. Jim Riddell, 305 Mr. Lebanon Blvd., Pittsburgh, PA 15234. (412) 563-2245.

Sincerely,

John Cimermancic

John Cimermancic
Industrial Project Engineer

plm

Infilco Degremont Inc
Water and Wastewater Treatment

Koger Executive Center Box K-7
Richmond, Virginia 23288
Telephone 804 285-9961
Telex 827464

December 13, 1979

L. Robert Kimball & Associates
615 West Highland Avenue
Ebensburg, Pennsylvania 15931

Attention: Mr. Richard Geisser

DEC 1 5 1979

Re: Carl A. White Water Reclamation Plant
Ernest Mines
Creekside, Indiana County, Pennsylvania

Gentlemen:

This will confirm our recent telephone discussion concerning the information requested in your Mr. R. O. Kohlbeck's letter of November 13.

The 165,000 GPD at 3% sludge works out to be 41,283 lbs/day. If this is dewatered in a 21-hour operating day, it would represent a dewatering rate of 1965 lbs/hr.

This will require two (2) No. F-3 FLOCPRESS units with a loading rate of 148 lbs/hr/ft of belt width.

The price of the equipment is: -

Two (2) - No. F-3 FLOCPRESS units, with Flocculator Control Panel, Polymer Feed System, Air Compressor, and Conveying System	$150,000
ADD - Two (2) - Sludge Feed Pumps	$ 10,000
Estimate for Installation.	$ 20,000

The connected horsepower is: -

Two (2) F-3 FLOCPRESS units @ 1.33	2.66 HP
Polymer Feed System - Lot	0.5 HP
Conveying System - Lot	3.0 HP
Air Compressor	1.0 HP
Two (2) Sludge Feed Pumps @ 5	10.0 HP
Total Connected Horsepower	17.16 HP

Kohlbeck

Infilco Degremont Inc

L. Robert Kimball & Associates
Ebensburg, Pennsylvania 15931

Re: Carl A. White Water Reclamation Plant
Ernest Mines
Creekside, Indiana County, Pennsylvania

The Operating and Maintenance Cost is: -

1 man - 24 hrs/day x 365 x $7.50/hr = $65,700 /year

3% Maintenance:

24 hrs/day x 365 x .03 x $7.50/hr = 1,971

Total Operating & Maintenance Cost = $67,671 /year

Space Required: 40' x 33' x 12' high

Polymer Cost - from Bench Test Report attached: -

From Run No. 2 -

7.1 lbs/T x $1.65/T = $ 11.71/Ton - Dry Weight Basis

We are enclosing the Bench Test Report on the sludge sample you recently submitted, along with descriptive material. Also, we are sending you (under separate cover) a sample jar of the cake so you can visually inspect it.

We believe the foregoing, with enclosures, provides you with the requested information but if not, please let us know.

Yours sincerely,

Frank A. Havlik

Frank A. Havlik, P. Eng.
Market Specialist

FAH:3T/07-08
Enclosures

FLOCPRESS BENCH TEST REPORT

Carl A. White Water Reclamation Plant
Ernest Mines
Creekside, Indiana County, Pennsylvania

Engrs: L. Robert Kimball & Associates
Ebensburg, Pennsylvania

Date: December 11, 1979

DATE OF TESTING:

Flocpress Bench Tests were run December 7, 1979, at the IDI Laboratory on a sample of sludge sent in by the Engineer.

TYPE OF SLUDGE:

Neutralized acid mine drainage. It appeared red in color, indicating a dominance of Ferric Hydroxide. The pH was about 8.5-9.

PURPOSE OF TEST:

To determine if Flocpress is the proper sludge dewatering machine, to determine type and amount of polymer flocculant, and estimated cost of polymer conditioning.

PROCEDURE:

To determine the proper polymer dosage, beaker tests were run. The following polymers were tried:

1.	Percol 726 Anionic	-	No floc resulted.
2.	Percol 720 Non-ionic	-	Good results.
3.	Percol 763 Cationic	-	Poor results.
4.	Percol 763, followed by Percol 726	-	Very good results.

Beaker tests were followed by full-scale bench tests. A 1000 ml sample was conditioned with polymer and slowly mixed for one minute.

This was followed by application to filter belt for free drainage for a period of two minutes, with filtrate being observed and measured. This was followed by application of a known pressure on a known area of the free drained sludge between a slotted drainboard and a pressing plate. The pressate observed and measured. Pressing time up to two minutes.

After pressing, the cake was checked to determine its ability to come free from the filter belt. It separated quite well. The foregoing duplicates the action which takes place in the Flocpress.

CONCLUSIONS:

From the attached bench test data sheet and observation, it can be concluded that:

1. The sludge can be dewatered with the Flocpress with acceptable results. The return is relatively clear, with capture in the area of 90%.

2. In Run No. 1, we used Percol 763 -- 12.8 lbs/T, and Percol 726 -- 1.4 lbs/T, in tandem, for a total of 14.2 lbs/T. At $1.65 per pound, the cost of polymer is $23.43. The cake was 10.5%.

3. In Run No. 2, we used Percol 720 -- 7.1 lbs/T. At $1.65/lb., the cost of polymer is $11.71. The cake was 10%.

4. The floc is of a nature that we would recommend the use of the Floc-Drum with the Flocpress.

5. For preliminary sizing, a loading rate of 100-200 lbs/hr/ft. of belt width can be used.

6. The space requirement for the Flocpress can be obtained from accompanying Bulletin DB845 and Drawings P845-1, -2, -3, -4, and P845-5.

By: F A Havlik

Frank A. Havlik, P. Eng.
Market Specialist

FLOCPRESS BENCH TEST DATA

Carl A. White Water Reclamation Plant
Ernest Mines
Creekside, Indiana County, Pennsylvania

Engrs: L. Robert Kimball & Associates
Ebensburg, Pennsylvania
Date: December 11, 1979

Type Sludge	Mine Drainage	Metal Hydroxide (Iron)
Test Run	No. 1	No. 2
Date Run	12/7/79	12/7/79
Feed Sludge, percent	2.8	2.8
Polymer, Cationic Percol 763, lbs/T	12.8	----
Polymer, Anionic Percol 726, lbs/T	1.4	----
Polymer, Non-ionic Percol 720, lbs/T	----	7.1
Vol. Sample, ml	1000	1000
Vol. Polymer, ml	220	200
Vol. Total, ml	1220	1200
Vol. Filtrate, ml	760	750
Vol. Pressate, ml	180	160
Vol. Total Extracted, ml	940	910
Vol. Retained, ml	280	290
Pressure, lbs/sq.in.	1.75	1.75
Area, Before - sq.in.	100	100
Area, After - sq.in.	110	110
Thickness, Before - in.	1/4	1/4
Thickness, After - in.	5/32	5/32
Filtrate, (S.S. mg/l)	70	140
Cake, percent	10.5	* 10

* Note: Some slight penetration of filter belt. Improved results can be expected with use of Dewatering Drum.

KOMLINE-SANDERSON ENGINEERING CORPORATION

MANUFACTURERS OF EQUIPMENT FOR THE PROCESS INDUSTRIES

MAIN OFFICE AND WORKS

PEAPACK, NEW JERSEY 07977

AREA CODE 201
PHONE 234-1000

TELEX
136-328

December 20, 1979

L. Robert Kimball & Associates
615 West Highland Avenue
Ebensburg, PA 15931

Attention: Mr. Roland A. Kohlbeck,
Vice-President

Reference: Carl A. White Water
Reclamation Plant at
Ernest Mines, Creekside
Indiana County, Pennsylvania

Dear Mr. Kohlbeck:

Attached please find a net present value analysis for the K-S Unimat installation you are considering. You will note I have used an 8% value rate in my analysis and also a straight line depreciation of 20 years. This does not include installation costs or any accessory utility or building cost related to this project.

Yours truly,

KOMLINE - SANDERSON

Edmund J. Busch
Sr. Applications Engineer

EJB:ggh

Attach.

cc: Komline-Sanderson
108 South Patton Drive
Coraopolis, PA 15108
Attn: Mr. F. H. Timblin, Mgr.

Kohlbeck

L. Robert Kimball
20-Year Amortization
Net Present Value

December 20, 1979
$120,000 Budget Price
21 TPD

Percol #728	$1.90	11.5#/ton	$459/day	
Percol #727	$1.70	9.2#/ton	$328/day	
			$787/day	$283,320/yr

HP	RT-2	1.5)	
	K-S Unimat	3.0)	
	2 Mixers	3.0)	17 HP = 12.75 kilowatts
	2 Poly. pumps	2.0)	110160 kilowatts/year
	Belt wash	7.5)	$3305/year

INCL CONTROL PANEL

Maintenance	60 hours/year x 7.5		$450/year
Spare Parts (set of belts & parts)		$6000/year	$6000/year

Operation

Depreciation $\frac{120,000}{20}$ = $6000/year

$299,075 = Total/year

Multiplier @ 8% = 9.33

$2,781,398
NPV

ROTARY - 6-6.5
UNIMAT - 12-12.5
PRE-CONT - 52%

"ECOSYSTEMS"
EURAMCA INC.

TELEX: 728476

P.O. Box 349 • 40 Fay Avenue
Addison, Illinois 60101
(312) 628-1313

CABLE: EURAMCA

November 28, 1979

DEC 1 1979

Mr. Roland A. Kohlbeck, P.E.
Vice President
L. ROBERT KIMBALL & ASSOCIATES
615 West Highland Avenue
Ebensburg, Pennsylvania 15931

Re: Carl A. White Water Reclamation Plant
at Ernest Mines, Creekside, Indiana County, PA.

Dear Mr. Kohlbeck:

Thank you for your letter of November 13, 1979 and the test data from L. Robert Kimball & Associates received on November 26, 1979. We are pleased to submit our now complete report of the sludge dewatering studies conducted at Ernest Mines, Creekside, PA.

This sludge is a metal hydroxide sludge with high lime sludge content (holds water) and a low d.s. concentration from the clarifier thickener (.5% to 1.5% d.s.). We were not optimistic when we agreed to undertake this project for you.

Mr. Sheker of Envirodyne Systems Inc. explained the plight of the State and the Creekside community to us. We thought that the situation measured up to being worthy of our best effort.

We thank you for the experience of being able to dewater a sludge which has the same performance characteristics as you would experience if you tried to dewater your "morning cup of coffee".

The report of the d.s. content of the infeed sludge we tested the day before we ran full scale tests may not have been correct. You will note the best estimate we could make for flocculant consumption on the basis of the "bench" test was 24 lbs. polymer/ton of d.s. dewatered. Based on full scale trials this was reduced to 15 lbs. per ton; average cost $30.00/ton of d.s. dewatered. This is really quite good for this type of sludge.

The data requested in your letter is enclosed.

Very truly yours,

John A. Drozda
EURAMCA ECOSYSTEMS INC.

JAD:nl
cc: Envirodyne Systems Inc.

Enclosures

ECOSYSTEMS
EURAMCA INC.

TELEX: 728476 P.O. Box 349 • 40 Fay Avenue Addison, Illinois 60101 (312) 628-1313 CABLE: EURAMCA

November 28, 1979

L. ROBERT KIMBALL & ASSOCIATES
615 West Highland Avenue
Ebensburg, Pennsylvania 15931

RE: BUDGET PROPOSAL
Carl A. White Water Reclamation Plant
at Ernest Mines, Creekside, Indiana County, PA.

165,000 gallons per day (625 m3/day) @ 3% dry solids
41,269 lbs. d.s./day (18,750 kg d.s./day)

165,000 gpd x 7 ÷ 5 = 231,000 gallons per day sludge
874 m3/day @ 3% dry solids
26,230 kg dry solids/day
57,733 lbs. dry solids/day

CRITERIA: 165,000 gallons per day liquid sludge infeed from clarifiers underflow
Dry solids content 3%
Note! Tests show an average of 1.5% to 1.7% d.s.

dewater to 20% d.s. cake. It would be quite impossible to dewater this sludge to 20% d.s. cake without the high capital cost of oversize machines and high polymer costs. Even under these ideal conditions the 20% d.s. is suspect. It is our opinion that 15% to 16% would be the d.s. limit and even this may not be possible economically speaking.

Our recommendation is to plan for a dewatering system which will keep operator time and chemical costs down.

Plan to dewater the sludge for chemical costs which do not exceed $30-$35 per ton of dry solids dewatered ($285 to $335 per day) based on our test data.

We know the sludge can be dewatered to 14%. Optimized Ecopress operation, polymer use could increase the dewatering efficiency to 16%. This sludge dewatering load can be handled by three (3) 1.5 meter Ecopresses running 22 hours per day, or two (2) 2.0 meter Ecopresses running 24 hours per day or two (2) 2.5 meter Ecopresses running 20 hours per day 5 days per week.

- continued -

As previously stated dry solids cake of 16% is reasonable and attainable. The dewatered sludge cake can then be automatically mixed directly at the belt press discharge with CaO in the Roediger Quick Lime Stabilization System to bring dry solids content up to 20% d.s. or higher. The Roediger mixer designed for this purpose intimately mixes the two (2) solid materials, promotes fast contact of the lime with the sludge solids, increases d.s. by the heat created from the chemical reaction of the the CaO with the cellular water in the sludge and brings the sludge pH up to 11 or 12. The CaO required per ton of d.s. dewatered is 660 lbs. CaO/ton of d.s. dewatered. In this case 7,800 lbs./day of CaO.

In this way hauling payloads are increased, the sludge is stabilized (pH 12). Pilot tests are adviseable.

COSTS: Budget price for the complete dewatering system with the Q.L.S. system included for each is:

Three (3) each	Model 15.3 Ecopress 1.5 meter belt width, control panels, sludge metering/polymer metering pumps, polymer preparation system, Q.L.S. system:	$350,000
Two (2) each	Model 20.3 Ecopress 2.0 meter belt width, control panels, sludge metering/polymer metering pumps, polymer preparation system, Q.L.S. system:	$300,000
Two (2) each	Model 25.3 Ecopress 2.5 meter belt width, control panels, sludge metering/polymer metering pumps, polymer preparation system, Q.L.S. system:	$340,000

SUMMARY: Ecopress Dewatering equipment and Q.L.S. system required to dewater sludge to a 20% d.s. cake or better:

A.	Three (3) Model 15.3 Ecopress Systems operating	22 hours/each	66 hours/day
B.	Two (2) Model 20.3 Ecopress Systems operating	24 hours/each	48 hours/day
C.	Two (2) Model 25.3 Ecopress Systems operating	20 hours/each	40 hours/day

CAPITAL COSTS:

A. $350,000

B. $300,000

C. $340,000

OPERATING COSTS: Per year based on 5 day week (260 days) three (3) shifts:

A. 17,160 hours/year

B. 12,480 hours/year

C. 10,400 hours/year

MAINTENANCE & OPERATION HOURS: Per year based on 5 day week (260 days) three (3) shifts, 4 hours per 8 hour shift for 2 or 3 Ecopresses including chemical preparation, Q.L.S. system, Ecopress Operation and Clean-up:

A., B., or C. 3,120 man-hours = $23,400.00

Dewatering chemicals - 15 lbs./ton of d.s. dewatered:

15 x 13 tons x 260 days x $2.00/lb. = $101,400

CaO for Q.L.S. system:

660 lbs. x 13 x 260 days = 1,115 tons/year x cost per ton _____ CaO.

SPARE PARTS: Replacement parts for one year trouble-free service:

The most signigicant wear items are belts and doctor blades. The normal belt life of a belt used to dewater a sludge with little or no fixed solids is 6,000 hours or better. The sludge at Carl A. White is a metal hydroxide sludge, no volatiles and very abrasive. Under these conditions we would expect belt life to run between 3,000 and 4,000 hours. Doctor blades are reversible and interchangeable so replacement does not occur frequently.

SPARE PARTS (cont'd):

Belt sets run an average of $3,060.00/set; i.e., $2,800 for the Model 15.3
$3,000 for the Model 20.3
$3,400 for the Model 25.3

Based on the hours of operation indicated:

A.	17,160 hours	Belt replacement/year	$16,800
B.	12,480 hours	Belt replacement/year	$12,000
C.	10,400 hours	Belt replacement/year	$13,600

Doctor blades - 2 sets/year/Ecopress: A. $3,200
B. $2,400
C. $2,400

Other items which could require replacement are not wear items so no estimate can be given. From experience from Ecopress belt filter presses in continuous operation for 7 years replacement parts other than belts and baldes average $2,000/year.

SUMMARY: Replacement Parts Cost/Year: A. $22,780
B. $16,320
C. $18,000

ELECTRICAL COSTS: Complete Sludge Dewatering System

Connected Horsepower:
A. 8 Hp/Model 15.3 Ecopress System x 3 = 24 Hp (17.9 kW)
B. 9 Hp/Model 20.3 Ecopress System x 2 = 18 Hp (13.5 kW)
C. 11.5 Hp/Model 25.3 Ecopress System x 2 = 23 Hp (17.2 kW)

*Complete Sludge Dewatering System: Chemical Mix System, Sludge Metering Pump, Polymer Metering Pump, Ecopress Belt Filter Press

ELECTRICAL COSTS: Q.L.S. System

Connected Horsepower: 10 Hp Mixer 7.5 kW
5 Hp Conveyor 3.8 kW

A.	Dewatering System:	17.9 kW x 17,160 hours x 0.03/kW =	$9,215/year
	Q.L.S. System:	11.3 kW x 17,160 hours x 0.03/kW =	$5,820/year
B.	Dewatering System:	13.5 kW x 12,480 hours x 0.03/kW =	$5,055/year
	Q.L.S. System:	11.3 kW x 12,480 hours x 0.03/kW =	$5,820/year
C.	Dewatering System:	17.2 kW x 10,400 hours x 0.03/kW =	$5,366/year
	Q.L.S. System:	11.3 kW x 10,400 hours x 0.03/kW =	$5,820/year

ECOPRESS Dimensions & Weights:

Model 15.3	Length	14.4 ft.	Width	7.2 ft.	Height	6.5 ft.	15,400 lbs.
Model 20.3	Length	14.4 ft.	Width	9.8 ft.	Height	6.8 ft.	17,000 lbs.
Model 25.3	Length	14.4 ft.	Width	11.1 ft.	Height	6.8 ft.	18,600 lbs.

Space Requirements:

A. Three (3) Model 15.3 Ecopresses, plus sub-support equipment

Building:	Length	29.5 ft.
	Width	54.0 ft.
	Clearance	11.0 ft.

B. Two (2) Model 20.3 Ecopresses, plus sub-support equipment

Building:	Length	29.5 ft.
	Width	42.0 ft.
	Clearance	11.0 ft.

C. Two (2) Model 25.3 Ecopresses, plus sub-support equipment

Building:	Length	29.5 ft.
	Width	42.0 ft.
	Clearance	11.0 ft.

The above dimensions will accomodate the additional conveyor space requirements for the Q.L.S. System.

We enclose a copy of our prequalification data which describes all the features and benefits of our Ecopress design, materials of construction, warranty and other useful information.

If we may be of further service to you please let us know or contact Envirodyne Systems Inc.

John A. Drozda
EURAMCA ECOSYSTEMS INC.

Enclosures

cc: Envirodyne Systems Inc.

SUMMARY OF TEST RESULTS

EURAMCA/ROEDIGER ECOPRESS 1.5 METER

CONTINUOUS BELT FILTER PRESS

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

November 7 - 8, 1979

EURAMCA ECOSYSTEMS INC.
40 Fay Avenue
Adison, Illinois 60101

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Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

INTRODUCTION

The Euramca/Roediger Ecopress was demonstrated by sludge dewatering specialists at "The Carl A. White Mine Water Reclamation Plant" near Creekside, Indiana County, Pennsylvania from November 7th to November 8th, 1979.

The mine water reclamation palnt receives up to 4.5 MGD acid mine drainage from the Ernest Mine Complex. The source of this acid water is the abandoned deep shafts of Ernest Mine Complex. The pH of the influent to the treatment plant can be as low as 2.5.

The treatment plant neutralizes the acid mine drainage by flash mixing the influent with a quick lime solution slurry. The neutralized mine drainage then flows to aeration tanks for iron removal treatment where oxygen converts ferrous iron to ferric iron.

The now neutralized (7-8.5 pH) mine drainage water treated for the removal of iron flows to four (4) clarifiers. Impurities in the mine drainage settle in the clarifiers and form an orange sludge having an average d.s. content of .5 to .7 % d.s.

The orange sludge is disposed of in an abandoned mine opening.

The dewatering of the sludge is now critical to the continued operation of the mine water reclamation plant due to the infiltration problems created by disposing of the liquid sludge effluent in an abandoned mine.

The sludge dewatering team from Euramca and Roediger evaluated the flocculation characteristics of the clarifier sludge by mixing .1% solution of various grades of cationic, anionic/cationic and anionic polymers of varying degrees of activity with clarifier sludge. In all cases the starting point for the evaluation consisted of a .1% polymer concentration in an amount of 10 to 500 ml (1/2 liter) of 0.5% d.s. sludge from the underflow of 1 of the 4 clarifiers at the treatment plant.

Twenty-six (26) polymer clarifer sludge combinations were tested on November 7th.

POLYMERS USED

Eight (8) cationic polymers ranging from; low to extremely high cationic activity
low to extremely high molecular weights

Two (2) anionic polymers ranging from; low to high anionic activity

See CHART I for the complete polymer listing and concentrations. All polymer concentrations for granular, powder and emulsion polymers were 0.1%.

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

LABORATORY PROCEDURE

For each test performed a sludge sample size of 500 mls was used. A reference polymer dosage rate of 20 mg/l was selected and varying polymer rates were applied to the separate sludge samples. Polymer dosages ranged from 20 to 140 mls/liter sludge.

Polymer consumption rates were calculated using the formula;

$$\text{lbs./ton d.s.} = \frac{2000 \times \%\ \text{floc solution} \times \text{ml of flocculant}}{*\ \%\ \text{solids sludge} \times \text{ml sludge}}$$

*No one at the Treatment Plant or the Consulting Engineer could tell us what the d.s. content in the infeed sludge was.

The Consultant took samples of the liquid sludge infeed to the Ecopress on Thursday's full scale test.

The Consultant will have to provide the following data for us to complete this repo :

1. d.s. in the infeed sludge % d.s.
2. d.s. in the cake
3. d.s. in the sludge after the pre-dewatering drum
4. d.s. in the sludge after the lst pressing zone
5. T.S.S. in the filtrate

Dry solids in the infeed sludge is necessary to be able to complete the calulations relative to pounds of polymer required per ton of d.s. dewatered.

On Wednesday, November 7th, the d.s. content of the clarifier sludge being evaluated was not known. It is assumed the d.s. generally is in a range of .5% to .7% d.s.

After mixing the polymer and sludge samples together, visual observation of floc size, configuration and stability were noted. The conditioned sludge sample was then poured onto a belt filter screen, mesh opening in Microns 550-750. The time for 150 mls of filtrate to accumulate and the volume of filtrate was recorded at 10, 15 and 20 seconds The slope of a plot time - seconds vers... volume of filtrate gives an indication of the drainage characteristics and sludge conditioning. The less the slope of the line the better the conditioning.

Compression tests of the flocculated and gravity dewatered sludge were conducted on the Euramca/Roediger Micro-Ecopress .2 meter laboratory belt press. The conditioned sludge was receptive to compression and a moderate amount of shear and milling. The compressed sludge exhibited good release characteristics. High pressure will cause the sludge to exude through the belts because the sludge solids are very fine. Due to the high lime content the capillary water will be difficult to press out in the final milling shearing zone of the Ecopress. The lime content of the sludge produces a delicate sludge which smears easily.

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

The Euramca/Roediger Ecopress mobile belt filter press was ordered into the treatment plant after the flocculation tests showed the treatment plant sludge could be properly conditioned for belt press dewatering with expected successful results.

The sludge cake samples from the full scale tests run on Thursday, November 8th, by L. Robert Kimball and Associates were placed in a drying oven at 103 degrees C for a minimum of 18 hours, in accordance with the testing procedures in Standard Methods. L. Robert Kimball and Associates provided the following data:

1. Dry solids of infeed sludge
2. Dry solids cake from the Ecopress mobile unit
3. Analysis of the liquid sludge infeed
4. Analysis of the sludge cake, amount of fixed solids (inorganic) in the sludge, and the composition
5. Filtrate quality T.S.S.
6. Dryness of sludge out of the:
   - A. Pre-dewatering drum
   - B. After the vacuum zone
   - C. After the first pressure zone

SUMMARY

The sludge tested at the Carl A. White Mine Water Reclamation Plant can be dewatered by a Euramca/Roediger Ecopress.

The polymer used for the full scale tests, Percol 767, was selected from the best series of flocculation tests.

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

CHART I - POLYMER LISTING

Allied Colloids - Cationic

Percol 728 @ 0.1%

Percol 767 @ 0.1%

~~Percol 776 @ 0.1%~~

Percol 788N @ 0.1%

Stockhausen - Cationic

Praestol 270FL @ 0.1%

Praestol 434K @ 0.1%

Praestol 444K @ 0.1%

Nalco - Cationic

Nalco 7129 @ 0.1%

Hercules - Cationic

Hercules 815 @ 0.1%

Allied Colloids - Anionic

Percol 726 @ 0.1%

Percol 720 @ 0.1%

CHART II - FLOCCULATION AND DRAINAGE TEST
0.5% d.s. Sludge Settled in the Clarifiers
Sludge Samples were from Clarifier #3

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

Polymer Name	Consumption lbs./ton	Filtrate ml	Time - Seconds
Percol 767 (old mixture) @ 0.1%	No Reaction	None	None
Percol 788N @ 0.1% 120 ml/500 ml sludge	96	160 ml	30 sec.

COMMENTS: Poor floc formation, very fine floc resulted in blinding the screen, extremely poor drainage, not suitable for gravity dewatering, poor filtrate

Percol 728 @ 0.1% 40 ml/500 ml sludge	32	150 ml	30 sec.

COMMENTS: Results are the same as for the 788N except polymer consumption is substantially less and the filtrate is better

Percol 776 @ 0.1%			
20 ml/500 ml sludge	No Reaction	None	None
40 ml/500 ml sludge	No Reaction	None	None
70 ml/500 ml sludge	No Reaction	None	None

COMMENTS: No reaction

CHART II - FLOCCULATION AND DRAINAGE TEST
0.5% d.s. Sludge Settled in the Clarifiers
Sludge Samples were from Clarifier #3

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

Polymer Name	Consumption lbs./ton	Filtrate ml	Time - Seconds
Percol 767 @ 0.1%			
20 ml/500 ml sludge	No Reaction		
40 ml/500 ml sludge	32	180 ml	15 sec.

COMMENTS: A dose of 20 ml of polymer/500 ml of sludge produced no favorable reaction. Doubling the dosage to 40 ml produced a fair to good floc, somewhat fragile with many appendages. The water separation was good and drainage less than ideal. Pressing produced a reasonably good cake with good release properties exhibited. Further pressing of the cake, from the belt lab model, by squeezing in the hand demonstrated the "dewatered" sludge still held some water. The sludge cake exhibited characteristics which indicate belt blinding by smearing of the sludge could be expected in full scale milling, pressing and shearing. The d.s. which make up the sludge floc are extremely fine, break up easily and will exude through the belt under high pressure. The Percol 767 was selected as one of the polymers to be tested on the full scale belt press test.

Percol 726 - Anionic Pretreatment

plus

Percol 788N - Cationic Treatment

COMMENTS: An anionic pretreatment of a 0.1% solution in a dosing amount of 10 ml/500 ml of sludge was mixed into the sludge. There was no favorable reaction. This was followed by a dose of 0.1% solution @ 10 ml of Percol 788N - Cationic Polymer/500 ml of sludge. There was no favorable reaction.

Additional increased dosages were mixed into the 500 ml sludge sample with no favorable reaction noted.

CHART II - FLOCCULAT[illegible] AND DRAINAGE TEST
0.5% d.s. Sludge Settled in the Clarifiers
Sludge Samples were from Clarifier #3

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

Polymer Name	Consumption lbs./ton	Filtrate ml	Time - Seconds
Praestol 434K @ 0.1%			
20 ml/500 ml sludge	No Reaction		
40 ml/500 ml sludge	No Reaction		
60 ml/500 ml sludge	32	240 ml	18 sec.

COMMENTS: The results for the Percol 434K were about equal to the results from the Percol 767. The floc appeared to be less stable with many appendages. Full scale pressing will have to handle the floc carefully.

Nalco 7129 @ 0.1%			
20 ml/500 ml sludge	16	No test run	No test run
30 ml/500 ml sludge	24	130 ml	15 sec.

COMMENTS: Results at 20 ml and 30 ml were about the same. Floc formation was good to fair, many appendages, good separation of water and below average drainage, delicate floc.

Hercules 815 @ 0.1%			
30 ml/500 ml sludge	No Reaction	None	None
60 ml/500 ml sludge	No Reaction	None	None
Praestol 270FL @ 0.1%			
60 ml/500 ml sludge	48	160 ml	20 sec.

COMMENTS: Good floc, good separation, drainage below average, sludge can be pressed, good release from the screen belt.

CHART II - FLOCCULATION AND DRAINAGE TEST
0.5% d.s. Sludge Settled in the Clarifiers
Sludge Samples were from Clarifier #3

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

Polymer Name	Consumption lbs./ton	Filtrate ml	Time - Seconds
Percol 767 - Test #2 with Percol 767 Emulsion			

COMMENTS: A dosing amount of 30 ml of polymer solution (0.1%) concentration was mixed with 90 ml of water to give a 3 : 1 water/polymer solution a (0.035%) solution.

This dilute solution was mixed with 500 ml sludge sample.

Before dilution the sludge floc formation and quality was about the same as exhibited in the first test of the Percol 767.

The results of the mixture of the dilute polymer mixture were about the same as the first and second tests which indicates polymer consumption can be reduced substantially with basically the same results. The full scale test was performed using a 0.1% solution at a rate of 20 ml of polymer/liter of sludge.

Percol 720 - Anionic @ 0.1% 10 ml/500 ml sludge			
plus			
Percol 767 - Cationic 0.1% 20 ml/500 ml sludge	24	200 ml	13 sec.

COMMENTS: This anionic/cationic test shows good floc, good separation, stable floc with more than usual appendages and average drainage qualities. Sludge can be pressed with good results expected with good release.

CHART II - FLOCCULAT I AND DRAINAGE TEST
0.5% d.. Sludge Settie in the Clarifiers
Sludge Samples were from Clarifier #3

Carl A. White
Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

Polymer Name	Consumption lbs./ton	Filtrate ml	Time - Seconds
Percol 720 - Anionic @ 0.1% 10 ml/500 ml sludge plus Praestol 434K 40 ml/500 ml sludge	No Reaction	None	None

COMMENTS: This final polymer test produced no favorable reaction.

FINAL NOTE

Based on the foregoing tests the Ecopress mobile unit was ordered into the treatment plant for 7:00 AM Thursday morning, November 8th. Preliminary belt tests began at 9:30 AM using Percol 767 Cationic Emulsion at a 0.1% concentration. By 12:30 PM the Ecopress was running at a stable rate and continued to run on this basis until the polymer supply was depleted. A new batch of Percol 767 was prepared and the Ecopress shut down.

The Ecopress was started with no adjustments from the operational mode used up until shut down. Representatives from L. Robert Kimball and Associates took samples of infeed sludge solids, sludge from the pre-dewatering drum, sludge from the vacuum zone, sludge from the first compression zone and off the Ecopress discharge. Filtrate samples were also taken.

The data sheets tabulating the sample data from the full scale tests are enclosed with summary comments and recommendations.

CHART III

SUMMARY ECOPRESS OPERATIONS DATA

Carl A. White Mine Water Reclamation Plant
Creekside, Indiana County, Pennsylvania

TEST NUMBER:	1	2
DATE:	11/8	11/8
TIME:	1400	1445
Sludge origin:	Clarifier	Clarifier
X Feed sludge throughput:		
A. gpm	40	40
B. m3/hr.	9.08	9.08
C. m3/hr x (m)	6.06	6.06
✓ Sludge feed % d.s.:	1.5	1.7
✓ Sludge pH:	7.50	7.40
X Sludge solids throughput:		
A. lbs/hr.	299.8	339.75
B. kg d.s./hr.	136.2	154.36
C. kg d.s./hr x (m)	90.8	102.9
✓ Cake Solids % d.s.:	14.0	12.8
✓ 1st Compression Zone:	-	8.4
✓ From Pre-Dewatering Drum		
D.S.:	-	6.3
X Polymer name:	Percol 767	Percol 767
X Polymer consumption:		
A. lbs/ton d.s.	15	15
B. gr/kg d.s.	7.49	7.49
C. gr/m3	112	127
X Cake thickness (mm):	-	-
X Belt Speed (m/min):	2.0	2.0
X Vacuum (m bar):	-	-
✓ Filtrate (mg/l):	6800 Dissolved	6000* *Approx.

X = Euramca/Roediger Data
✓ = L. Robert Kimball & Associates' Data