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EBASCO

REM III PROGRAM

REMEDIAL PLANNING ACTIVITIES AT SELECTED UNCONTROLLED HAZARDOUS SUBSTANCE DISPOSAL SITES

FINAL DESIGN REPORT
REMEDIAL DESIGN
WIDE BEACH DEVELOPMENT SITE
WIDE BEACH, NEW YORK
TOWN OF BRANT
ERIE COUNTY, NEW YORK
FEBRUARY 1989

APPENDIX E
PROCESS EQUIPMENT DESIGN REPORT

EPA CONTRACT 68-01-7250

EBASCO SERVICES INCORPORATED

EPA WORK ASSIGNMENT NUMBER: 86-2L46
EPA CONTRACT NUMBER: 68-01-7250
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NOTICE

The information in this document has been funded by the United State Environmental Protection Agency (USEPA) under the REM III Contract No. 68-01-7250 to Ebasco Services Incorporated (Ebasco). However, This document does not represent the USEPA's position or policy and has not been formally released by the USEPA.

FINAL REPORT
ON
EQUIPMENT DESIGN

WIDE BEACH SUPERFUND SITE

FEBRUARY 1, 1989

GALSON RESEARCH CORPORATION
EAST SYRACUSE, NY

EXECTIVE SUMMARY

The Wide Beach superfund site in Irving, New York is a summer residential community which has been contaminated by oil containing PCBs used to oil the local road for purposes of dust control. Approximately 20,000 cubic yards of soil have been contaminated and are scheduled for excavation, chemical decontamination and replacement on site. A pilot study conducted in the summer of 1988 demonstrated the efficacy of the batch chemical decontamination process and provided the data for the conceptual design of the full scale processing equipment. This report contains the results of the conceptual design.

TABLE OF CONTENTS

1. Process design

1.1 Design criteria

The major design criteria/assumptions for the process unit to be used at Wide Beach are summarized below;

1. Capacity : 100 cubic yards/day
2. Cleanup limit : 2 ppm PCB
3. Soil pretreatment : Size reduction to 1/4 inch (no other pre-treatment

4. Nominal cycle time : 12 hours/batch
5. Nominal availability rate : 70% (= % of time equipment is up and running at rated
6. Operating schedule : 24 hours/day, 365 days/year
7. All processing equipment mobile/transportable

1.2 Process Flow diagram and mass balance

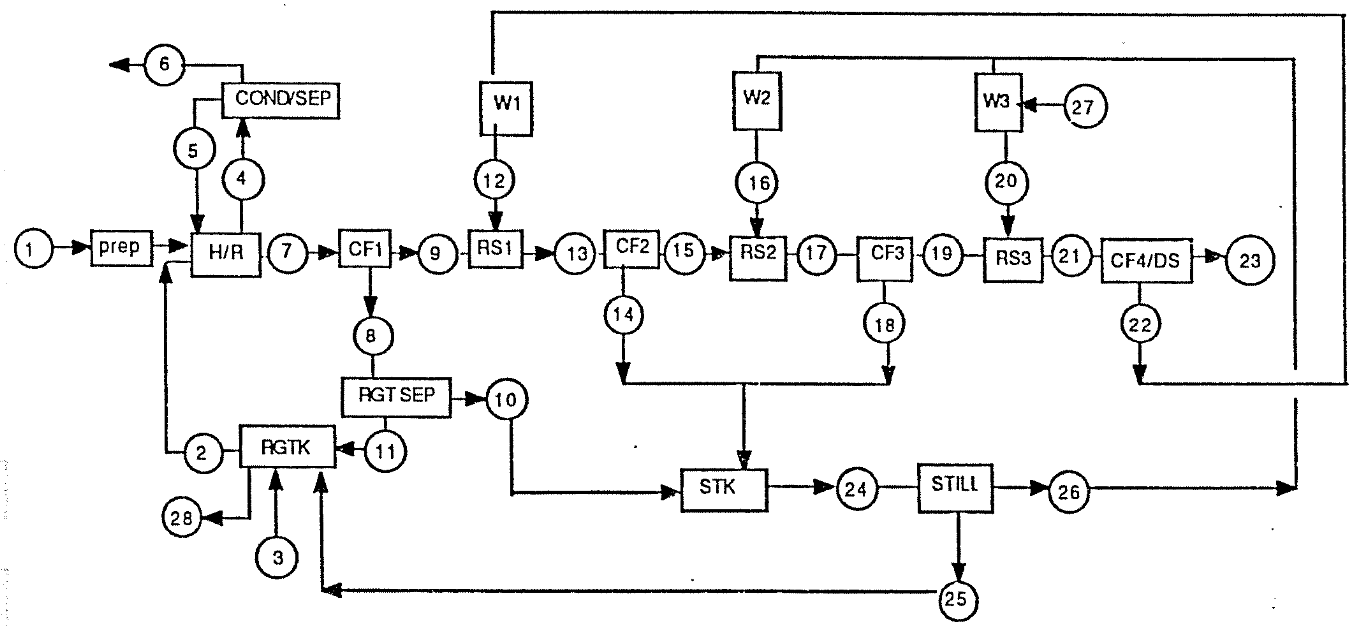
The general process flow diagram is shown on the following page, along with a pro-forma mass balance. In the batch chemical PCB soil decontamination process, contaminated soil (1) is introduced into the reactor along with recycled reagent (2). During the heatup [H/R], water and other volatiles (4) are evaporated from the soil and condensed. Oils and other lighter than water materials (6) are separated from the water fraction (5) and pumped out for off-site disposal. After the PCBs have been reacted, the non-PCB soil and reagent are mixed with the water fraction of the condensate (5). The decontaminated soil/water mixture (7) is centrifuged [CF1] to separate excess reagent (8) and soil (9). The soil after centrifuging (9) is then washed with water three times to remove reacted PCB and to recover reagent for re-use. The decontaminated and washed soil (23) is then discharged and the cycle repeated.

The reagent and washes are either recycled directly (11) to the reagent tank [RGTK] or sent (10,14,18) to the distillation feed tank [STK]. The distillation feed tank mixture (24) is distilled to produce fresh water (26) for water washes 2 and 3 and to produce reagent (25) for recycle to the reagent tank. Makeup water (27) is added to the wash 3 feed (20) to compensate for the water taken out with the decontaminated soil (23). Sulfuric acid is added to the water makeup (27) to adjust the pH of the decontaminated soil (23).

Under normal operating conditions, the process has no air emissions. The volatile materials evaporated from the reactor during heatup (4) are condensed using an air cooled condenser. During pilot trials, this unit was backed up with an ice cooled condenser and a drum filter containing both activated carbon and molecular sieve. None of the pilot plant runs showed any material passing the air cooled condenser.

Drawing #1

FULL SCALE BATCH PROCESS DIAGRAM



(1) Contaminated soil into reactor
(2) Reagent into reactor
(3) Makeup reagent into reagent tank
(4) Volatiles from reactor heatup
(5) Water return
(6) Hydrocarbons from separator
(7) Soil/reagent slurry from reaction
(8) Reagent decant from first centrifugation
(9) Soil decant from first centrifugation
(11) Water/reagent from decant to reagent tank
(10) Water/reagent from decant to still
(12) First wash water input
(13) Soil/water slurry from first wash
(14) Reagent/water decant from second centrifugation
(15) Soil decant from second centrifugation
(16) Second wash water input
(17) Soil/water slurry from second wash
(18) Reagent/water decant from third centrifugation
(19) Soil decant from third centrifugation
(20) Wash water input for third wash
(21) Soil/water slurry from third wash
(22) Water/reagent from 4th centrifugation
(23) Decontaminated soil
(24) Water/reagent feed to distillation system
(25) Reagent from distillation system
(26) Water from distillation system
(27) Water/acid makeup to system
(28) Salt blowdown from reagent tank

(#) Numbered process stream
H/R Heatup/reaction step
COND/SEP Vapor condensation/hydrocarbon separation
CF1 CF2 CF3 1st, 2nd, 3rd centrifuge steps
RGT SEP Reagent separation
RGTK Reagent tank
RS1 RS2 RS3 1st, 2nd, 3rd reslurry steps
W1 W2 W3 Wash water tanks 1,2,3
STK Distillation feed tank
STILL Distillation system
CF4/DS 4th centrifuge step/solids discharge
prep soil preparation

PRO-FORMA MASS BALANCE - WIDE BEACH SI TE PER BATCH

Stream #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Description														
Mass, thousand lbs	56.0	33.6	0.24	19.0	19.0	0.0	89.6	31.4	58.2	16.4	14.9	33.6	91.8	33.1
Klbs soil	44.8	0.0	0.00	0.0	0.0	0.0	44.8	0.0	44.8	0.0	0.0	0.0	44.8	0.0
Klbs water	11.2	5.6	0.00	16.8	16.8	0.0	16.8	11.8	5.0	6.2	5.6	33.3	38.4	26.9
Klbs KOH	0.0	5.6	0.05	0.0	0.0	0.0	5.6	3.9	1.7	2.1	1.9	0.0	1.7	1.2
Klbs PEG	0.0	5.6	0.05	0.0	0.0	0.0	5.6	3.9	1.7	2.1	1.9	0.1	1.8	1.3
Klbs TMH	0.0	5.6	0.05	0.0	0.0	0.0	5.6	3.9	1.7	2.1	1.9	0.1	1.8	1.3
Klbs DMSO	0.0	11.2	0.10	2.2	2.2	0.0	11.2	7.8	3.4	4.1	3.7	0.2	3.6	2.5
Klbs PCB products	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs PCB	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs HC misc	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs sulfuric acid	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Stream #	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Description														
Mass, thousand lbs	58.7	33.6	92.3	33.4	58.9	33.6	92.5	33.6	58.9	83.0	18.4	64.6	2.6	0.0
Klbs soil	44.8	0.0	44.8	0.0	44.8	0.0	44.8	0.0	44.8	0.0	0.0	0.0	0.0	0.0
Klbs water	11.5	33.6	45.1	31.6	13.5	33.6	47.1	33.0	14.1	64.6	0.0	64.6	2.6	0.0
Klbs KOH	0.5	0.0	0.5	0.4	0.2	0.0	0.2	0.1	0.0	3.6	3.6	0.0	0.0	0.0
Klbs PEG	0.5	0.0	0.5	0.4	0.2	0.0	0.2	0.1	0.0	3.7	3.7	0.0	0.0	0.0
Klbs TMH	0.5	0.0	0.5	0.4	0.2	0.0	0.2	0.1	0.0	3.7	3.7	0.0	0.0	0.0
Klbs DMSO	1.1	0.0	1.1	0.8	0.3	0.0	0.3	0.2	0.1	7.4	7.4	0.0	0.0	0.0
Klbs PCB products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs PCB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs HC misc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs sulfuric acid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0

reagent/wash loading	60%
% Stage efficiency	70%
% soil carryover	0%
% Reagent loss	0.71%
Evaporation load K#	84
MM BTU/hr	20.91

Reagent formula	
% KOH	17%
% water	17%
% PEG	17%
% TMH	17%
% DMSO	33%

NOT E; 0.00 IMPLIES < 0.1, NOT 0.000...

NOTE;ASSUMES 20% SOIL MOISTURE

2. Description and discussion of unit operations

2.1 Soil preparation

Soil preparation prior to treatment includes the following;

1. Excavation of the soil and placement near the processing area.
2. Stockpiling of the soil adjacent to the process area (minimum 30 day processing supply) and covering the soil to prevent water infiltration. Water from the soil cover is to be collected and used as makeup water for the treatment process.
3. Sizing of the excavated soil to maximum 1/4 inch, using a crusher as needed. Grass and other vegetation need not be removed, but should be sized to avoid possible problems in the centrifuging steps.

Pre-treatment drying and classification (other than for sizing) are not required.

2.2 Mixing of reagent and soil

Soil is added to the reactor using a conveyor belt or similar device. The reagent is pumped into the reactor after the soil is loaded, and mixed within the reactor by the use of a ribbon blender or agitator with full side wall wipe (to avoid caking of sticky materials on the reactor walls). For full scale design, such internal fittings should be kept to an absolute minimum to avoid caking and maintainance problems.

Reagent is added to the reactor at a loading of 60# reagent/100# soil. The soil as excavated and loaded has a density of approximately 2000 #/cubic yard, so the reagent loading is approximately 60% by volume (1 cubic yard = 202 gallons). The reagent formulation used was 17% potassium hydroxide (KOH), 17% water, 17% polyethylene glycol 400 (PEG 400), 17% Dowanol TMH (TMH) and 33% dimethyl sulfoxide (DMS).

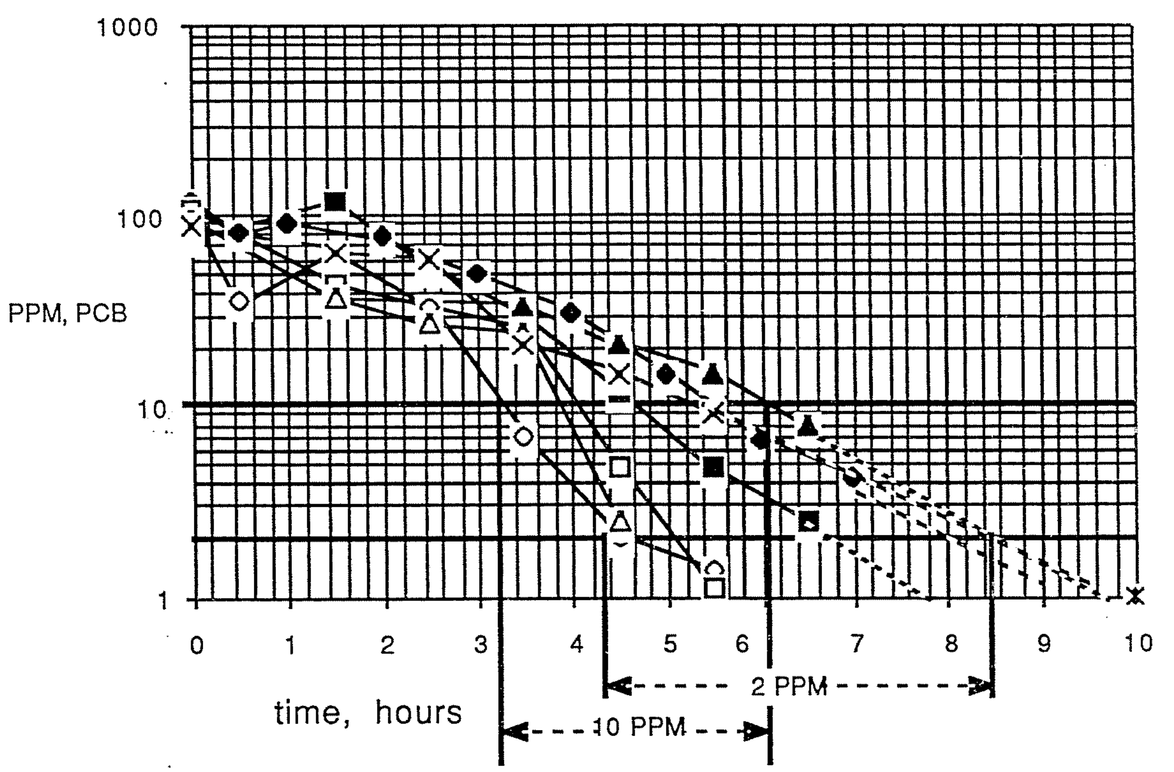
2.3 Heating and reaction

The reactor unit is jacketed to and heat transfer fluid (HTF) is used. Steam was considered as a heat transfer fluid for the reactors, but was rejected due to operating problems (particularly for outdoor operation under winter operating conditions). The double effect evaporator however uses steam generated by an HTF heated heat exchanger located on the evaporator trailer. Heating of the thermal fluid is done by twin thermal fluid heaters located on the heater trailer. These heaters are each sized at 10,000,000 BTU/hr.

Reaction temperatures for operation are nominally 150 °C. The reaction time for each batch is largely a function of the cleanup limit. The times required for the pilot plant reactions to reach cleanup levels of 10 ppm and 2 ppm (including heatup times) are shown in the reaction graph below;

FIGURE # 1

PPM,PCB DECAY VERSUS TIME (HOURS)



For a 10 ppm cleanup concentration, an average of 4.75 hours was required for heatup and reaction in the pilot plant testing. For a 2 ppm cleanup level, an average of 6.25 hours was required (note: some times are extrapolated). Thus, cleanup to 2 ppm required an average of 1.5 hours more than cleanup to 10 ppm.

2.4 Separation of soil, reagent and wash water

The pilot testing for the Wide Beach site originally planned the use of a pressure filter for the separation of soil, reagent and water. However, the soil selected for pilot testing had a higher proportion of clay than the soil used in laboratory testing, and did not filter well. A quick test with a solid bowl centrifuge gave good results, and a larger centrifuge unit was quickly obtained and incorporated into the processing.

During the processing at Wide Beach, at the end of the reaction step, the soil/reagent slurry was mixed with water to replace water volatilized during the heatup and to provide ebullient cooling for the reactor contents. The cooled soil/reagent slurry was then pumped to a 500 g solid bowl centrifuge and separated into liquid and solid fractions. The ratio of the amount of liquid partitioned between the solid and liquid fractions of the centrifuge output is the centrifuge stage efficiency, ie

$$\% \text{ Stage efficiency} = \frac{\#\text{ liquid in liquid output of centrifuge}}{\#\text{ liquid in slurry input to centrifuge}} \times 100$$

Stage efficiencies during pilot testing ranged from 33% to 77%, as tabulated below;

Run #	Decant	Wash 1	Wash 2	Wash 3
4	37	51	54	54
5	33	46	54	55
6	57	71	72	72
7	Results unusable - glycol leak into system			
8	64	68	71	77
9	41	50	48	49
10	50	57	52	55
Average	47	57	58	60

The increase in stage efficiency going from the reagent decant to the water washes may be due to the decrease in slurry viscosity. The reagent mixture when cold is very viscous, although the viscosity drops dramatically with increasing temperature. In the full scale equipment it will be possible to control the temperature of the reagent mixture and this should remove the difference in stage efficiency between the decant and the washes.

Due to time and equipment limitations, the pilot plant testing at the Wide Beach site used a very simple centrifuge system which was gravity fed at poorly controlled rates. In order to determine the possible improvements in stage efficiency due to more sophisticated equipment, a series of laboratory tests was conducted at the Bird Centrifuge laboratory in Massachusetts. The test data are tabulated below;

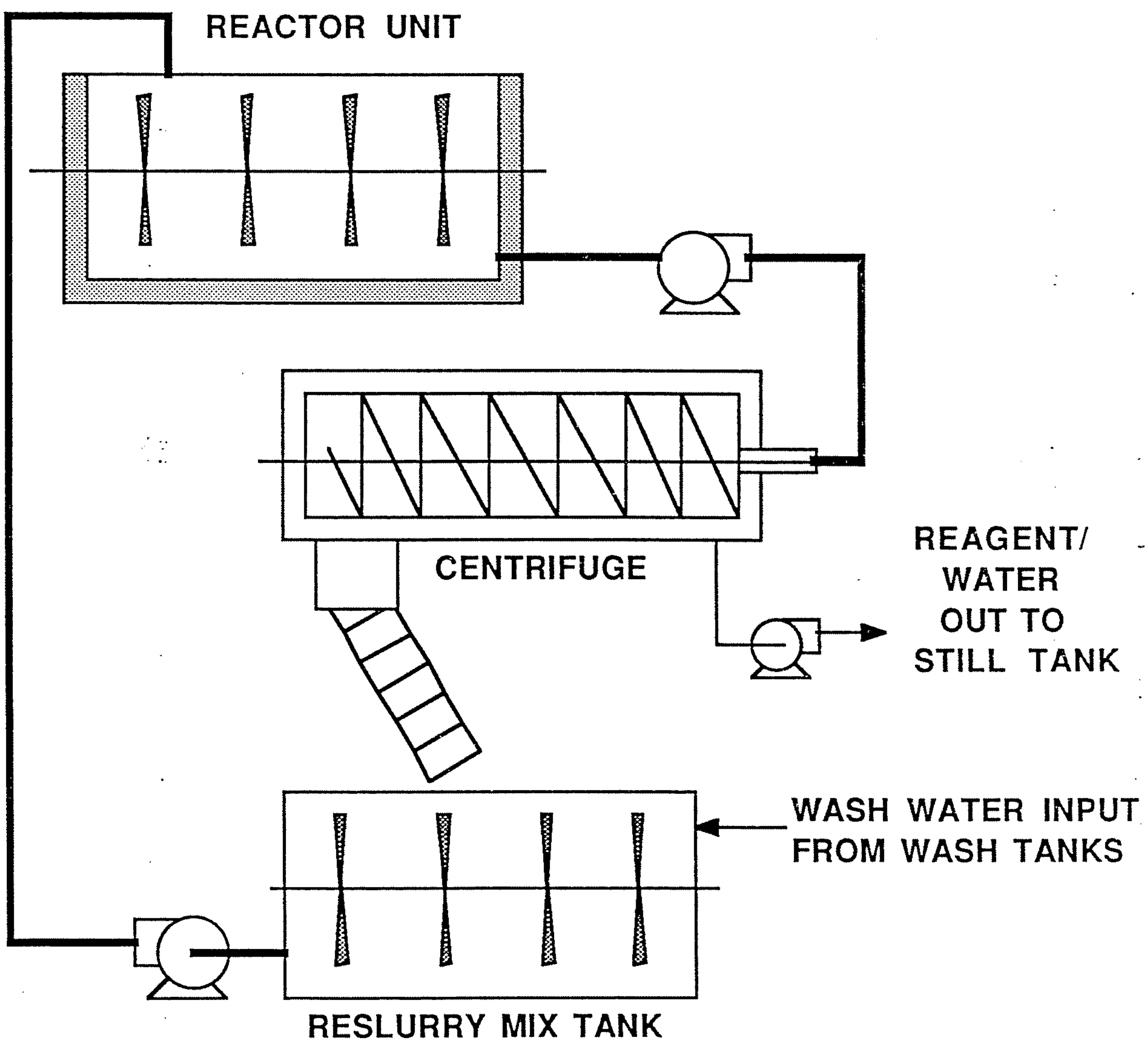
Spl #	Description	% Stage Efficiency
1	Reaction slurry	78.2
2	Wash 1 slurry	77.6
3	Wash 2 slurry	81.5
4	Wash 3 slurry	71.9
Average		77.3

For purposes of design, a centrifuge stage efficiency of 70% was assumed for all mass balance and sizing calculations.

The diagram below shows the flow path of material between the reactor unit (1 of 3), centrifuge and re-slurry mix tank during the reagent separation and soil washing steps.

DRAWING # 2

MATERIAL FLOW PATH



Following centrifugation, the solids from the centrifuge are conveyed to the reslurry mix tank, where they are mixed with wash water and pumped as a slurry back to the reactor. The reactor slurry is then fed to the centrifuge at a controlled rate, and the process repeated until all of the washes have been performed.

The staging of the soil, reagent and water separation operations is critical to the overall functioning of the process. There are 3 reactors, 1 reslurry tank and 1 centrifuge planned for the full scale process. The interaction between these pieces is shown in the diagram following;

FIGURE # 2
STAGEING TIME VERSUS FUNCTION

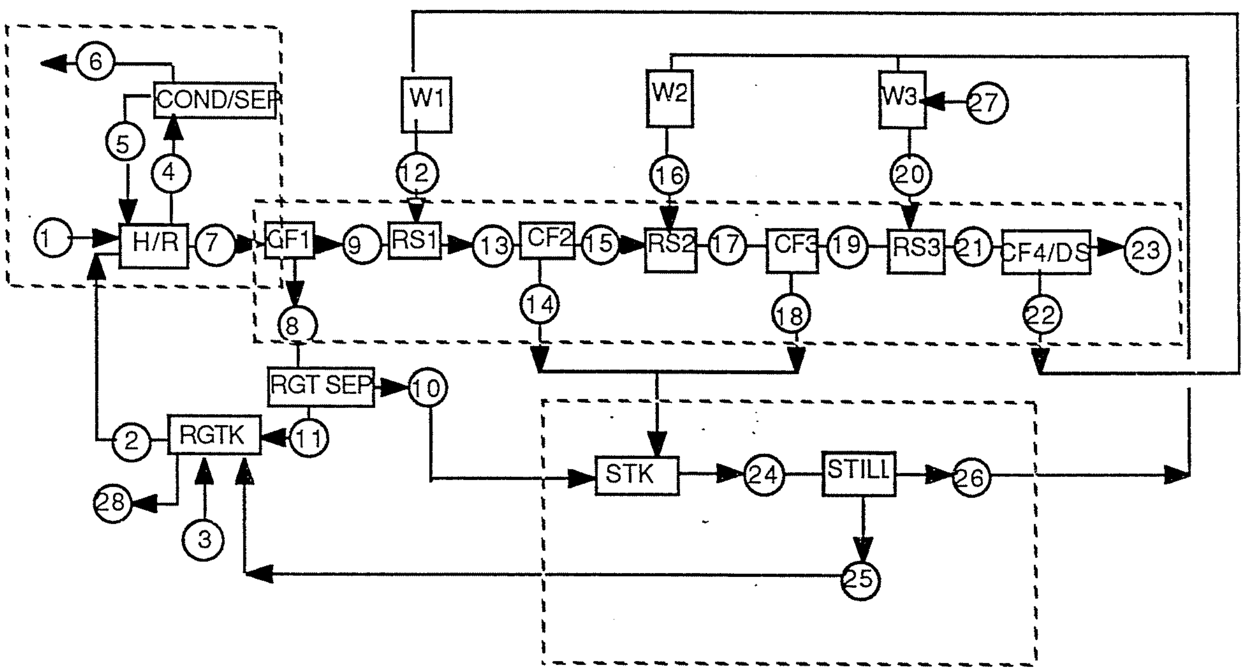
PROCESS STEP	CLOCKTIME	1	2	3	4	5	6	7	8	9	10	11	12	13
Load soil	0.5 hours	--												--
Load reagent	0.25 hours	-												-
Heatup/volsn	3.0 hours	--	----	----	-									--
reaction	3.5 hours				--	----	----	----						
analysis	1.0 hours								----					
pumpout/centfgn	0.5 hours									--				
reslurry	0.5 hours									--				
pumpout/centfgn	0.5 hours										--			
reslurry	0.5 hours										--			
pumpout/centfgn	0.5 hours											--		
reslurry	0.5 hours											--		
pumpout/cf/disge	0.5 hours												--	
Load soil	0.5 hours					--								
Load reagent	0.25 hours					-								
Heatup/volsn	3.0 hours					--	----	----	--					
reaction	3.5 hours								--	----	----	----		
analysis	1.0 hours												----	
pumpout/centfgn	0.5 hours													--
reslurry	0.5 hours													--
pumpout/centfgn	0.5 hours													
reslurry	0.5 hours													
pumpout/centfgn	0.5 hours													
reslurry	0.5 hours													
pumpout/cf/disge	0.5 hours													
Load soil	0.5 hours									--				
Load reagent	0.25 hours									-				
Heatup/volsn	3.0 hours									--	----	----	--	
reaction	3.5 hours												--	----
analysis	1.0 hours													
pumpout/centfgn	0.5 hours													
reslurry	0.5 hours													
pumpout/centfgn	0.5 hours													
reslurry	0.5 hours													
pumpout/centfgn	0.5 hours													
reslurry	0.5 hours													
pumpout/cf/disge	0.5 hours													

The process steps for each reactor are staggered so that no two reactors are loading, heating or centrifuging at the same time. An overall process cycle time of 12 hours is shown, which assumes a 6.5 hour heatup/reaction time (2 ppm cleanup level). This staging allows heating of the reactors by a single boiler, leaving the other unit to serve the needs of the wash water distillation/reagent recovery processing.

2.5 Wash water distillation/reagent recovery

The full scale process diagram (see section 1.2) shows all of the 11 inter-related process steps and 27 process streams involved in the soils decontamination process. These steps can be reduced to 3 major loops; soil loading/reaction, soil washing, and wash water distillation/reagent recovery, as shown in the diagram below;

DRAWING # 3
FULL SCALE PROCESS DIAGRAM



The reaction loop is the simplest, being contained within the confines of the reactor trailer. The soil washing loop is the most complicated in that it involves transfer of soil and soil/water slurry between the reactor, the centrifuge and the reslurry mix tank. The wash water distillation step, while more complex than the reaction, is largely uncoupled from the other steps. Liquid from the soil washing loop goes to a still feed tank (STK), while water from the distillation goes to feed the wash water storage tanks (W1,2,3). This lack of direct connection to the other processes allows the distillation to proceed largely unaffected by process interruptions occuring in other process areas.

The wash water distillation loop consists of a feed tank, a distillation system and a set of wash water tanks. As long as these tanks do not become overfilled or empty, changes in the soil washing cycle should not affect the distillation loop.

2.6 Treatment of process wastes

Waste production from this process is minimal, and can be divided into 3 basic areas;

1. Contaminated personal protective equipment (PPE)
2. Organic salts from reaction of PCB
3. Reagent left over at end of processing

Wastes are kept to a minimum because water and reagent are exhaustively recycled and reused. Contaminated PPE will consist mostly of gloves, and should be a relatively small stream. The estimated mass of PCB product from the 20,000 yards of site soil at a nominal 100 ppm PCB is around 8,000 lbs. The mass of leftover reagent at the end of the project is much greater, at around 120,000 lbs, or 15 times the mass of PCB reaction product. The PCB and leftover reagent materials removed from the system at the end of processing will be incinerated at an EPA approved incinerator.

2.7 Reagent storage

Reagent for makeup use on the site will be transported to and stored on site in 55 gal. drums. The original charge of reagent will be transported in tank trucks and stored in the reagent tank trailers. Given the relatively low expected rate of reagent consumption (240 lbs/batch or 3 drums/day), it is not anticipated that bulk storage of reagents outside of the tank trailers will be either necessary or desirable.

2.8 Equipment sizing, duty and processing capacity

Equipment sizing is constrained by the following considerations and assumptions, as previously noted in section 1.1;

1. All equipment to be mobile/transportable, ie to fit in an envelope 8.5'x13.5'x45'.
2. Processing rate of 100 cubic yard/day at 70% availability, ie 100/0.7 or 143 yard/day minimum nameplate capacity.
3. Minimum cost/batch desired.

These constraints lead to the goal of maximum size equipment (consistent with assumption 1) and minimum cycle time. The maximum reactor found to date which will fit in the size specified has a total volume of 7000 gallons and a working volume of 5650 gallons (80% of total) or 28 cubic yards. The extra volume allows for thermal expansion and possible foaming. All other process equipment is sized to match a set of three 28 yard units running on a 12 hour cycle. This gives a nameplace capacity of 168 yards/day and a probable processing rate of 118 yards/day at 70% availability.

The cycle diagram in section 2.4 gives the process times needed to make a 12 hour cycle time possible. A portion of that cycle diagram is reproduced below;

FIGURE # 3
CYCLE DIAGRAM

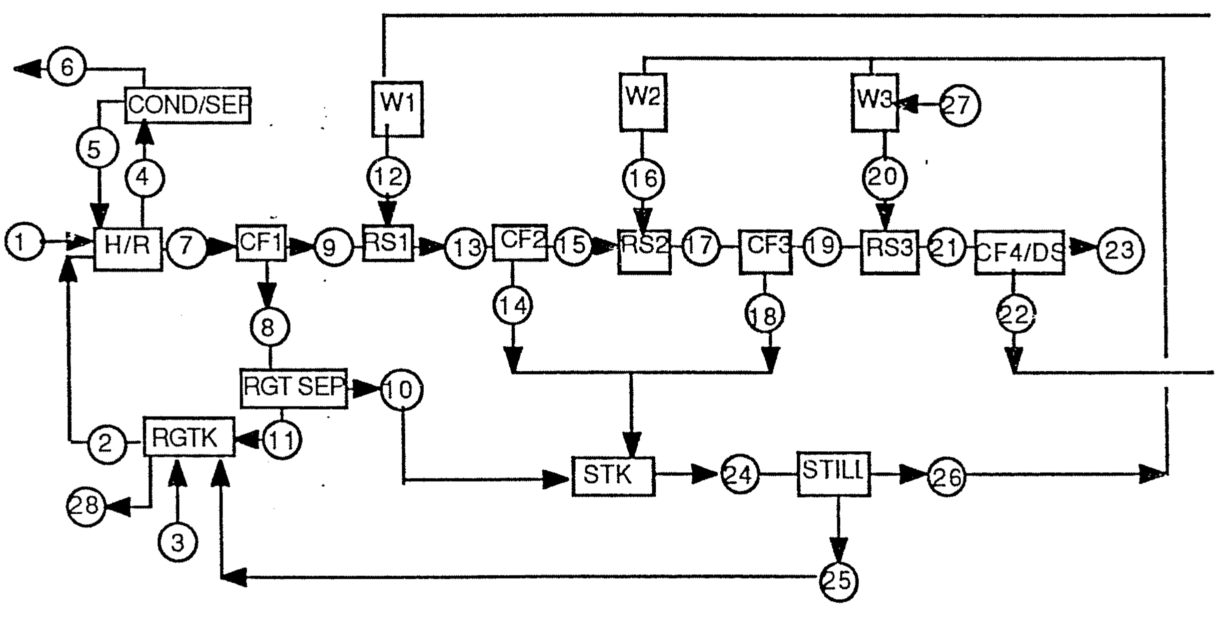
PROCESS STEP	CLOCKTIME	1	2	3	4	5	6	7	8	9	10	11	12	13
Load soil	0.5 hours	--												--
Load reagent	0.25 hours	-												-
Heatup/volsn	3.0 hours	--	----	----	--									--
reaction	3.5 hours				--	----	----	----						
analysis	1.0 hours								----					
pumpout/centfgn	0.5 hours									--				
reslurry	0.5 hours									--				
pumpout/centfgn	0.5 hours										--			
reslurry	0.5 hours										--			
pumpout/centfgn	0.5 hours											--		
reslurry	0.5 hours											--		
pumpout/cf/disge	0.5 hours												--	

Given the listed cycle times, an assumed reagent loading, soil density, incoming soil water level and centrifuge efficiency, it is then possible to both construct a mass balance and to size all remaining process equipment. Based on the results of the pilot testing, the following values are assumed for purposes of design;

Soil density	2000#/cubic yard
Soil moisture level	20% by weight
Reagent loading	60% by weight
Reagent formulation	1:1:1:1:2 KOH/PEG/TMH/Water/DMSO
Centrifuge stage efficiency	70% (compromise between batch centrifuge datafrom pilot plant and continuous centrifuge data from Bird Centrifuge lab trials - see appendix)

These are the values used to give the pro-forma mass balance listed in section 1.2 and reproduced in part below;

DRAWING # 4
MASS BALANCE



PRO-FORMA MASS BALANCE - WIDE BEACH SITE PER BATCH

Stream #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Description														
Mass, thousand lbs	56.0	33.6	0.24	19.0	19.0	0.0	89.6	31.4	58.2	16.4	14.9	33.6	91.8	33.1
Klbs soil	44.8	0.0	0.00	0.0	0.0	0.0	44.8	0.0	44.8	0.0	0.0	0.0	44.8	0.0
Klbs water	11.2	5.6	0.00	16.8	16.8	0.0	16.8	11.8	5.0	6.2	5.6	33.3	38.4	26.9
Klbs KOH	0.0	5.6	0.05	0.0	0.0	0.0	5.6	3.9	1.7	2.1	1.9	0.0	1.7	1.2
Klbs PEG	0.0	5.6	0.05	0.0	0.0	0.0	5.6	3.9	1.7	2.1	1.9	0.1	1.8	1.3
Klbs TMH	0.0	5.6	0.05	0.0	0.0	0.0	5.6	3.9	1.7	2.1	1.9	0.1	1.8	1.3
Klbs DMSO	0.0	11.2	0.10	2.2	2.2	0.0	11.2	7.8	3.4	4.1	3.7	0.2	3.6	2.5
Klbs PCB products	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs PCB	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs HC misc	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs sulfuric acid	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Stream #	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Description														
Mass, thousand lbs	58.7	33.6	92.3	33.4	58.9	33.6	92.5	33.6	58.9	83.0	18.4	64.6	2.6	0.0
Klbs soil	44.8	0.0	44.8	0.0	44.8	0.0	44.8	0.0	44.8	0.0	0.0	0.0	0.0	0.0
Klbs water	11.5	33.6	45.1	31.6	13.5	33.6	47.1	33.0	14.1	64.6	0.0	64.6	2.6	0.0
Klbs KOH	0.5	0.0	0.5	0.4	0.2	0.0	0.2	0.1	0.0	3.6	3.6	0.0	0.0	0.0
Klbs PEG	0.5	0.0	0.5	0.4	0.2	0.0	0.2	0.1	0.0	3.7	3.7	0.0	0.0	0.0
Klbs TMH	0.5	0.0	0.5	0.4	0.2	0.0	0.2	0.1	0.0	3.7	3.7	0.0	0.0	0.0
Klbs DMSO	1.1	0.0	1.1	0.8	0.3	0.0	0.3	0.2	0.1	7.4	7.4	0.0	0.0	0.0
Klbs PCB products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs PCB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs HC misc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Klbs sulfuric acid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0

reagent/wash loading	60%
% Stage efficiency	70%
% soil carryover	0%
% Reagent loss	0.71%
Evaporation load K#	84
MM BTU/hr	20.91

Reagent formula

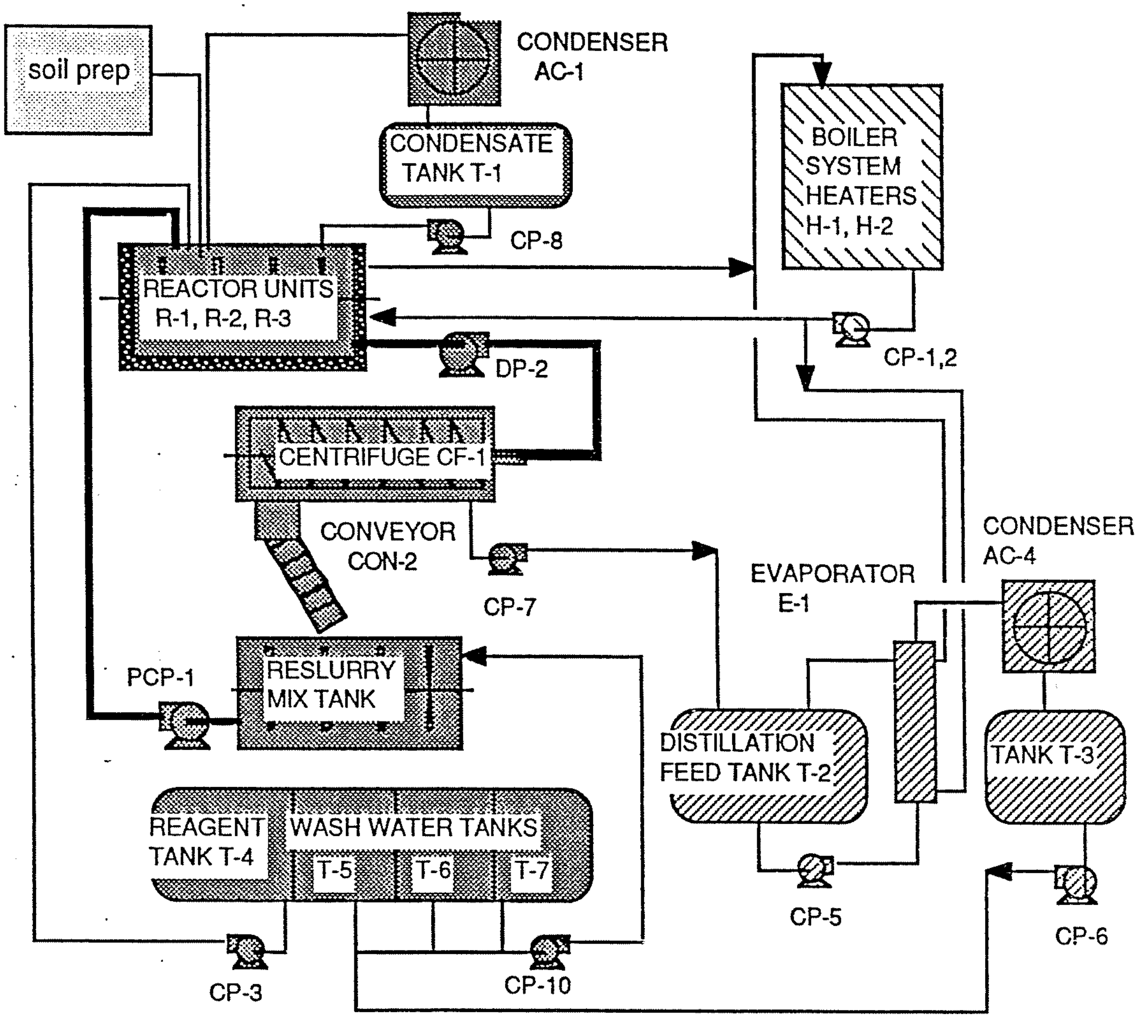
% KOH	17%
% water	17%
% PEG	17%
% TMH	17%
% DMSO	33%

NOTE; 0.00 IMPLIES < 0.1, NOT 0.000...

NOTE:ASSUMES 20% SOIL MOISTURE

The simplified P&ID shown below can be combined with the proforma mass balance and the cycle time diagram to size the major pieces of equipment.

DRAWING # 5
P&ID



Item #	Equipment description	Volume/unit	Duty
R-1	reactor unit (1 of 3)	28 cubic yards/batch	150 °C, 5 psig, 400 hp
CP-3	Reagent feed pump	34,000#/0.25 hours	200 gpm
AC-1	air cooled condenser	19,000#/3 hours	6.5 MM BTU/hour
T-1	condensate tank	2300 gallons	ambient
CP-8	condensate pump	2300 gallons/1 hour	200 gpm
DP-2	reactor slurry pump	89,600#(6000 gal)/30 min	200 gpm
CF-1	centrifuge	16 ton liquid/30 min	40 ton/hour
CP-7	centrifuge liquid pump	32,000 #/30 min	200 gpm
CON-2	conveyor from CF-1	58,000 #/30 min	120,000 pph
MT-1	reslurry mix tank	92,000#/30 min	ambient
CP-10	wash water feed tank	34,000# (4100 gal)/30 min	200 gpm
PCP-1	MT-1 slurry pump	92,000#/30 min	500 gpm
E-1	Dbl effect evaporator	65,000# water /batch soil	20 MM BTU/hr(max)
T-2	Evaporator feed tank	21,000#/hour feed	6000 gallon

AC-4	Evaporator condenser	8,000#/hour water	16MM BTU/hr
T-3	Evap. condenser tank	2,000 gph water	2300 gallon
CP-6	Evap. condenser pump	2,000 gph water	200 gpm
H-1,2	Boilers	1100 gpm HTF each	10MM BTU/hr each

The current process design attempts to match the capacity of each subsystem within a reasonable tolerance, so that each system has some amount of additional capacity. The limiting factor on process capacity in the current treatment system design is the capacity of the reactors. The centrifuge also has limited additional capacity (20%). If a single effect evaporator is used then the boiler capacity becomes a limiting factor.

2.9 Process monitoring and control requirements

The current process system is relatively simple and easy to control. The primary process monitoring variables are temperature, pressure and PCB concentration. In the reactor and evaporator systems, temperatures are controlled by varying the flowrate of hot heat transfer fluid (HTF) through the shell side of the reactor jacket or evaporator heat exchanger. Reactor pressures are controlled by controlling the rate of temperature rise. PCB concentration is determined by laboratory analysis.

Flowrates through the various pumps are largely controlled on an "as fast as possible" basis. One exception is the centrifuge feed pump DP-2, which maintains an even flowrate of mixed soil/liquid slurry to the centrifuge. This flowrate is controlled by controlling air pressure to the diaphragm pump (manual valve).

2.10 Operation and maintenance requirements

The primary operational consideration is to avoid creating a potential hazard to area residents. This will require careful consideration of excavation and soil sizing activities to avoid dust generation. It may be necessary as well to setup noise barriers between the operating areas and local residences. Constant communication with area residents and frequent public information notices will be necessary. During pilot testing it was found that area residents are very accomodating, as long as they are kept informed.

Maintenance requirements for the soil processing system should not differ greatly from those for any chemical plant. Scheduled maintenance intervals for process equipment will be set by the manufacturer's recommendations and should be religiously adhered to. In particular, given the potentially dusty conditions of operation, lubrication schedules must be set for all applicable equipment after consultation with the vendors. Based on pilot plant experience, mechanical seals should be avoided to the extent possible.

Spare parts for maintenance may be kept on-site, at near-by vendor locations or at manufacturer warehouses. However, any required spare parts should be available within 24-72 hours in order to insure continuity of operation. Approximately 180 days are available for processing at this site, with approximately 55 days estimated for process repair and malfunction. Long delivery times or poor availability for spare parts will therefore interfere with timely completion of this project.

2.11 Power and other utility requirements

The soils processing operation will require 4 constant inputs;

1. Replacement reagent
2. Makeup water
3. Boiler fuel
4. Electrical power

The primary need for boiler fuel is for volatilization of water and heatup of reactor contents. The BTU requirements for each batch include;

1. Reactor heatup - 89,600# from 30°F to 300°F. Assuming a Cp = 0.9 BTU/#°F (conservative estimate), this equals

   89,600 x (300-30) x (0.9) = 21,800,000 BTU

2. Reactor soil water volatilization - at 20% incoming moisture, this involves boiloff of 19,000 # water or 19,000,000 BTU

3. Reagent/wash water distillation - at 64,600 # water/batch, this is 64,600,000 BTU. However, the use of a double effect evaporator, assuming 90% thermal efficiency, reduces this load to 34,000,000.

Thus total BTU load for each batch equals

Sensible heat	21.8 MM BTU
Soil water boiloff	19.0
Wash water distillation	34.0
Total	74.8 MM BTU/batch soil

For three reactors at 12 hours/batch, this comes to about 450,000,000 BTU/day. For fuel oil with a heat value of 20,000 BTU/#, a total of 22,500 # or 3,000 gallons would be required on a daily basis

The primary use of electrical power in the processing system is for the reactor mixers, the reslurry tank and the centrifuge. These items total 2000 hp, and if all in operation simultaneously would require a power supply of 1670 kW (assuming 90% efficiency). Therefore the total power load to the facility is on the order of 2000 kW.

2.12 Health and safety requirements

The health and safety requirements for this operation are similar to those for other chemical plants. The hazards present, in estimated order of probability, include;

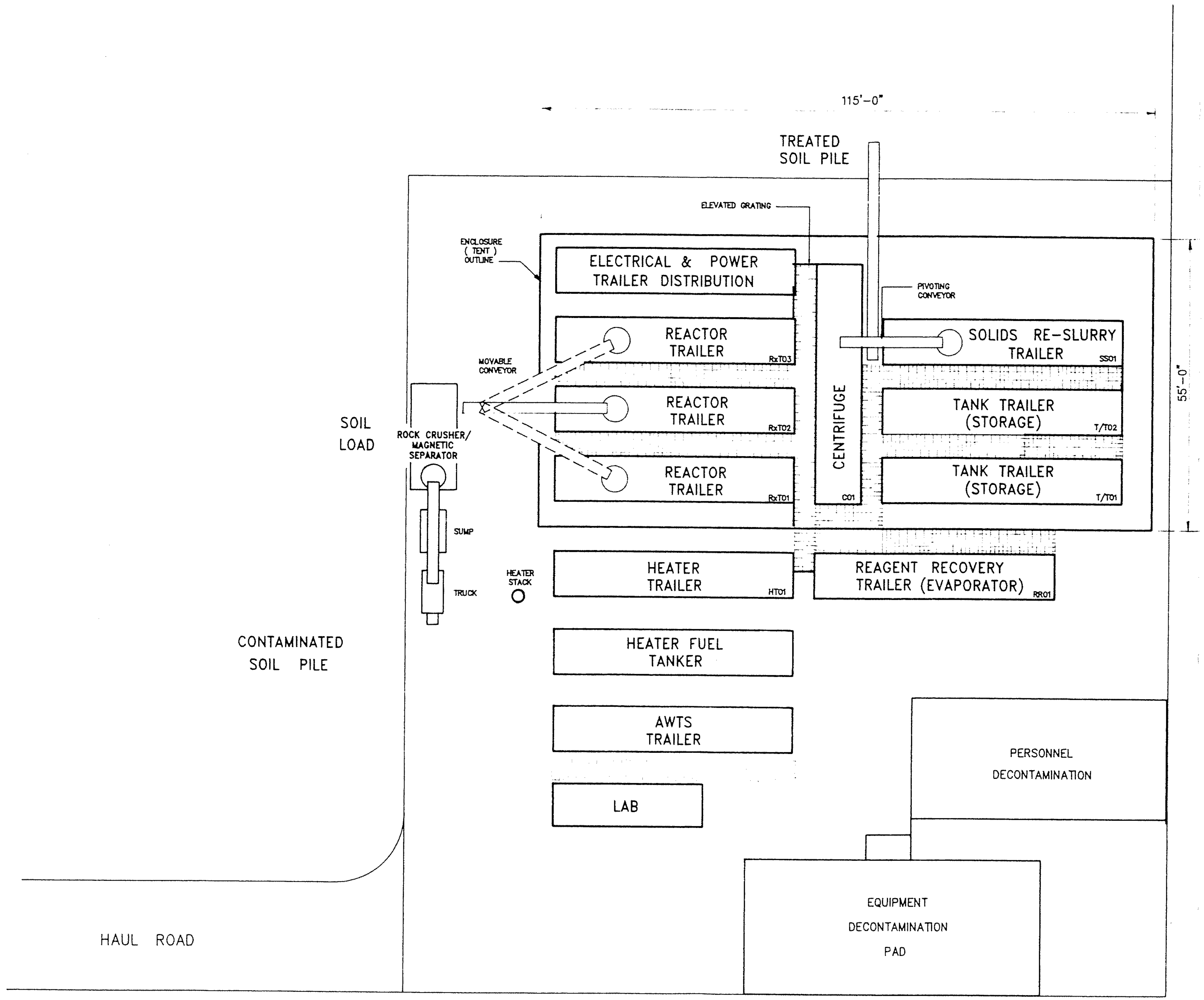
Slips and falls (especially during winter operation)
Vehicular accidents
Contact with caustic reagent
PCB dust and vapor inhalation

Primary safety precautions include keeping all walk areas free of snow and ice, backup alarms on all moving equipment, and use of protective equipment during all sampling and maintenance operations. Given the low initial concentration of PCBs in the area soil (average < 100 ppm), PCB vapor inhalation is expected to be less of a problem than PCB dust transport. To control PCB dust, all contaminated material must be covered to the extent possible, and regular personnel air samples will be necessary during potential exposure operations. Air samples taken during pilot operations showed extremely low PCB levels, but the size of the soil piles used during full scale processing may give a different result.

3. Drawings

The following drawings detail the proposed equipment for the Wide Beach PCB site cleanup. These drawings include;

1. The overall layout of the processing area
2. General piping and instrument diagram
3. Reactor trailer layout
4. Centrifuge trailer
5. Slurry mix trailer
6. Tank trailer
7. Reagent recovery trailer
8. Heater trailer



G.R.C. SOIL DECONTAMINATION UNIT GENERAL ARRANGEMENT

N

0 5 10 20
GRAPHIC SCALE
(IN FEET)

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JOB NUMBER:	88-046
DATE:	JANUARY 31, 1989
DESIGNED BY:	WSB
DRAWN BY:	WSB
CHECKED BY:	NAC
SCALE:	

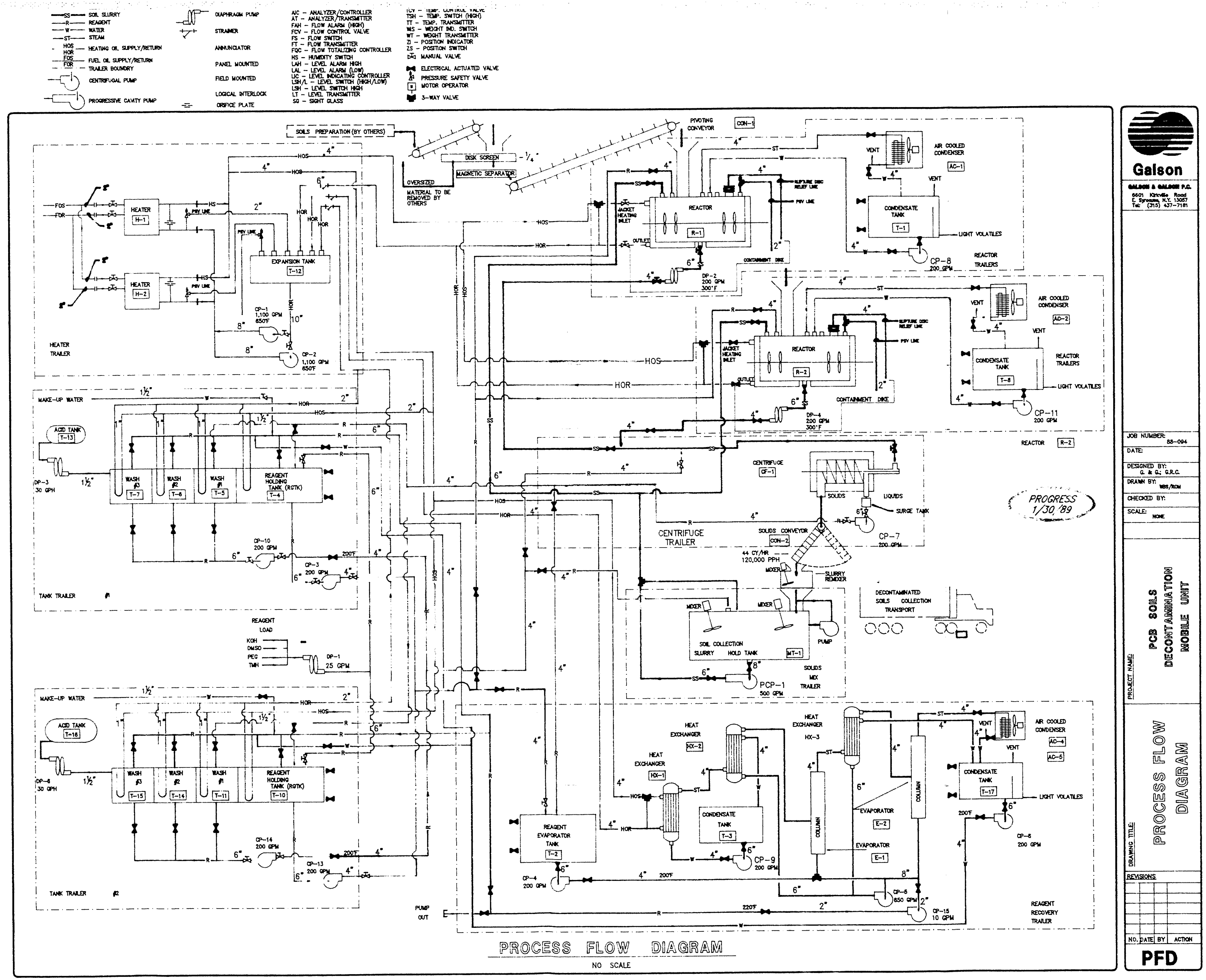
PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

DRAWING TITLE: GENERAL ARRANGEMENT TRAILER LAYOUT

REVISIONS

NO.	DATE	BY	ACTION

GA1


SOIL SLURRY
REAGENT
WATER
STEAM
HEATING OIL SUPPLY/RETURN
FUEL OIL SUPPLY/RETURN
TRAILER BOUNDRY
CENTRIFUGAL PUMP
PROGRESSIVE CAVITY PUMP
DIAPHRAGM PUMP
STRAINER
ANNUNCIATOR
PANEL MOUNTED
FIELD MOUNTED
LOGICAL INTERLOCK
ORIFICE PLATE
AIC – ANALYZER/CONTROLLER
AT – ANALYZER/TRANSMITTER
FAH – FLOW ALARM (HIGH)
FCV – FLOW CONTROL VALVE
FS – FLOW SWITCH
FT – FLOW TRANSMITTER
FQC – FLOW TOTALIZING CONTROLLER
HS – HUMIDITY SWITCH
LAH – LEVEL ALARM HIGH
LAL – LEVEL ALARM (LOW)
LIC – LEVEL INDICATING CONTROLLER
LSH/L – LEVEL SWITCH (HIGH/LOW)
LSH – LEVEL SWITCH HIGH
LT – LEVEL TRANSMITTER
SG – SIGHT GLASS
TCV – TEMP. CONTROL VALVE
TSH – TEMP. SWITCH (HIGH)
TT – TEMP. TRANSMITTER
WIS – WEIGHT IND. SWITCH
WT – WEIGHT TRANSMITTER
ZI – POSITION INDICATOR
ZS – POSITION SWITCH
MANUAL VALVE
ELECTRICAL ACTUATED VALVE
PRESSURE SAFETY VALVE
MOTOR OPERATOR
3-WAY VALVE
SOILS PREPARATION (BY OTHERS)
DISK SCREEN
MAGNETIC SEPARATOR
OVERSIZED MATERIAL TO BE REMOVED BY OTHERS
PIVOTING CONVEYOR
CON-1
HEATER H-1
HEATER H-2
EXPANSION TANK T-12
CP-1 1,100 GPM 650°F
CP-2 1,100 GPM 650°F
HEATER TRAILER
REACTOR R-1
JACKET HEATING INLET
OUTLET
CONTAINMENT DIKE
DP-2 200 GPM 300°F
RUPTURE DISC RELIEF LINE
PSV LINE
AIR COOLED CONDENSER AC-1
CONDENSATE TANK T-1
LIGHT VOLATILES
CP-8 200 GPM
REACTOR TRAILERS
REACTOR R-2
DP-4 200 GPM 300°F
AIR COOLED CONDENSER AC-2
CONDENSATE TANK T-8
CP-11 200 GPM
MAKE-UP WATER
ACID TANK T-13
DP-3 30 GPH
WASH #3 T-7
WASH #2 T-6
WASH #1 T-5
REAGENT HOLDING TANK (RGTK) T-4
CP-10 200 GPM
CP-3 200 GPM
TANK TRAILER #1
CENTRIFUGE CF-1
SOLIDS
LIQUIDS
SURGE TANK
CP-7 200 GPM
CENTRIFUGE TRAILER
SOLIDS CONVEYOR CON-2
44 CY/HR 120,000 PPH
MIXER
SLURRY REMIXER
DECONTAMINATED SOILS COLLECTION TRANSPORT
SOIL COLLECTION SLURRY HOLD TANK MT-1
PUMP
PCP-1 500 GPM
SOLIDS MIX TRAILER
PROGRESS 1/30/'89
REAGENT LOAD
KOH
DMSO
PEG
TMH
DP-1 25 GPM
ACID TANK T-16
DP-6 30 GPH
WASH #3 T-15
WASH #2 T-14
WASH #1 T-11
REAGENT HOLDING TANK (RGTK) T-10
CP-14 200 GPM
CP-13 200 GPM
TANK TRAILER #2
PUMP OUT
HEAT EXCHANGER HX-1
HEAT EXCHANGER HX-2
HEAT EXCHANGER HX-3
REAGENT EVAPORATOR TANK T-2
CP-4 200 GPM
CONDENSATE TANK T-3
CP-9 200 GPM
COLUMN
EVAPORATOR E-2
EVAPORATOR E-1
CP-5 650 GPM
CP-15 10 GPM
AIR COOLED CONDENSER AC-4 AC-5
CONDENSATE TANK T-17
CP-6 200 GPM
REAGENT RECOVERY TRAILER
PROCESS FLOW DIAGRAM
NO SCALE
Galson
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6601 Kirkville Road
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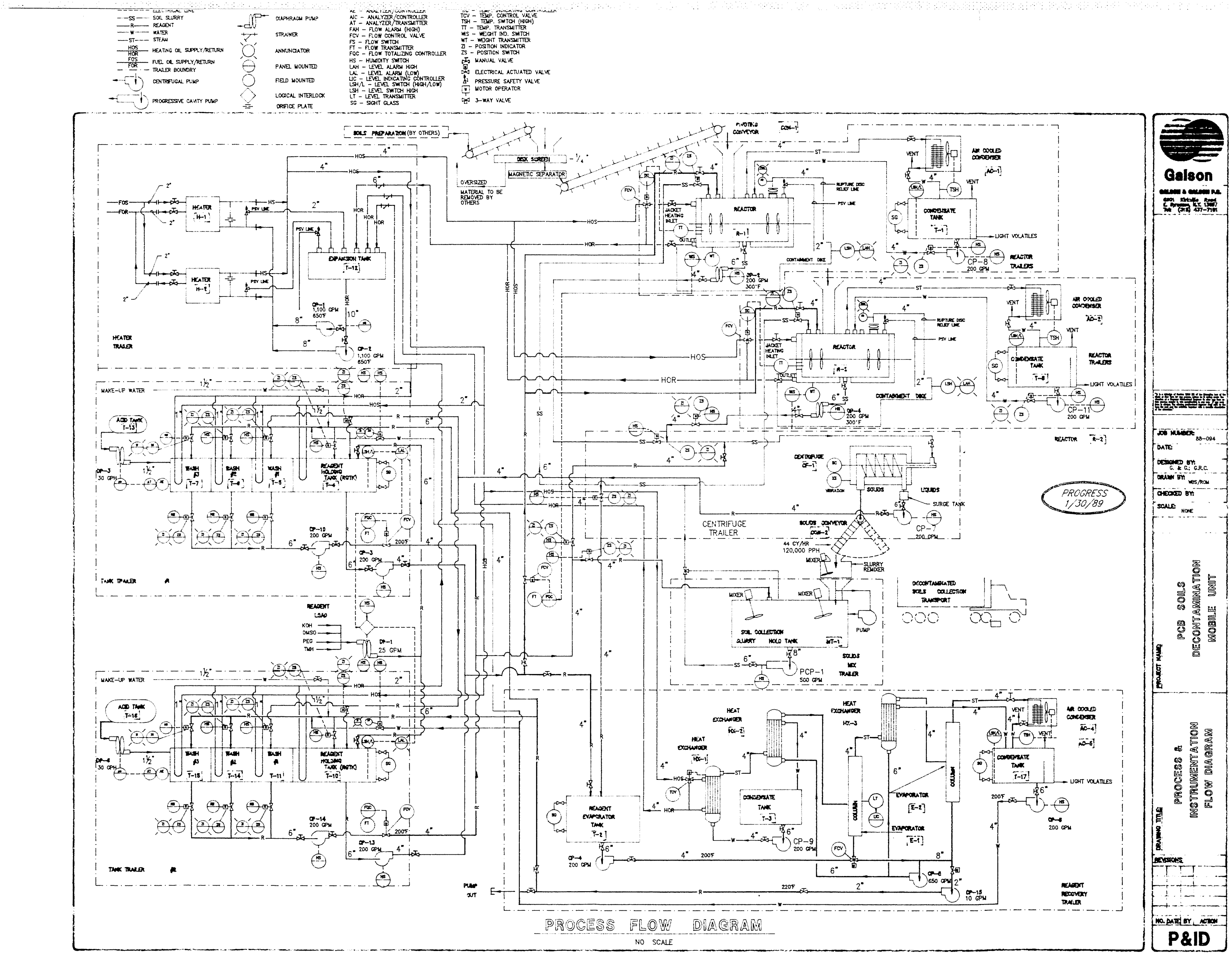
Tel: (315) 437-7181
JOB NUMBER: 88-094
DATE:
DESIGNED BY: G. & G.; G.R.C.
DRAWN BY: WBS/RCM
CHECKED BY:
SCALE: NONE
PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT
DRAWING TITLE: PROCESS FLOW DIAGRAM
REVISIONS
NO. DATE BY ACTION
PFD



SS SOIL SLURRY
R REAGENT
W WATER
ST STEAM
HOS / HOR HEATING OIL SUPPLY/RETURN
FOS / FOR FUEL OIL SUPPLY/RETURN
TRAILER BOUNDRY
CENTRIFUGAL PUMP
PROGRESSIVE CAVITY PUMP
DIAPHRAGM PUMP
STRAINER
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MANUAL VALVE
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SOILS PREPARATION (BY OTHERS)
DISK SCREEN
MAGNETIC SEPARATOR
OVERSIZED MATERIAL TO BE REMOVED BY OTHERS
PIVOTING CONVEYOR
HEATER H-1
HEATER H-2
EXPANSION TANK T-12
CP-1 1,100 GPM 650°F
CP-2 1,100 GPM 650°F
HEATER TRAILER
REACTOR R-1
REACTOR R-2
AIR COOLED CONDENSER AC-1
AIR COOLED CONDENSER AC-2
CONDENSATE TANK T-1
CONDENSATE TANK T-6
LIGHT VOLATILES
CP-8 200 GPM
CP-11 200 GPM
REACTOR TRAILERS
CONTAINMENT DIKE
RUPTURE DISC RELIEF LINE
PSV LINE
JACKET HEATING INLET
OUTLET
200 GPM 300°F
MAKE-UP WATER
ACID TANK T-13
ACID TANK T-16
CP-3 30 GPM
CP-6 30 GPM
WASH T-7
WASH T-6
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REAGENT HOLDING TANK (RGTK) T-4
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WASH T-11
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CP-10 200 GPM
CP-3 200 GPM
CP-14 200 GPM
CP-13 200 GPM
200°F
TANK TRAILER
REAGENT LOAD
KOH
DMSO
PEG
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DP-1 25 GPM
CENTRIFUGE CF-1
SOLIDS
LIQUIDS
SURGE TANK
VIBRATION
CENTRIFUGE TRAILER
SOLIDS CONVEYOR CON-2
44 CY/HR 120,000 PPH
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MIXER
SLURRY REMIXER
SOIL COLLECTION SLURRY HOLD TANK MT-1
PUMP
PCP-1 500 GPM
SOLIDS MIX TRAILER
DECONTAMINATED SOILS COLLECTION TRANSPORT
PROGRESS 1/30/89
HEAT EXCHANGER HX-1
HEAT EXCHANGER HX-2
HEAT EXCHANGER HX-3
REAGENT EVAPORATOR TANK T-2
CONDENSATE TANK T-3
CP-9 200 GPM
CP-4 200 GPM
COLUMN
EVAPORATOR E-2
EVAPORATOR E-1
CP-5 650 GPM
CP-15 10 GPM
AIR COOLED CONDENSER AC-4 AC-5
CONDENSATE TANK T-17
CP-6 200 GPM
220°F
PUMP OUT
REAGENT RECOVERY TRAILER
PROCESS FLOW DIAGRAM
NO SCALE
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DRAWN BY: WBS/RCM
CHECKED BY:
SCALE: NONE
PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT
DRAWING TITLE: PROCESS & INSTRUMENTATION FLOW DIAGRAM
REVISIONS
NO. DATE BY ACTION
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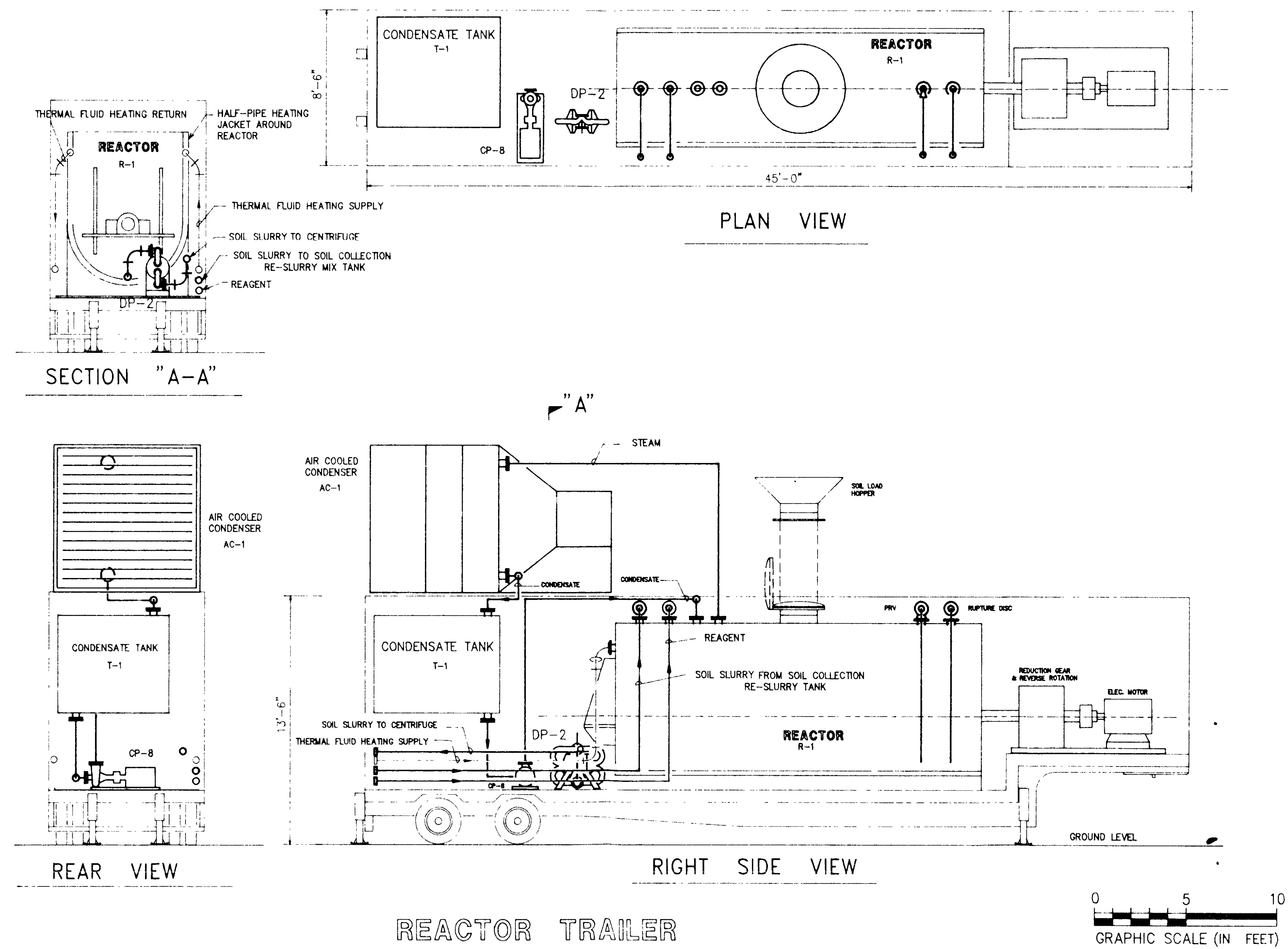

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DATE: NOV. 30, 1988
DESIGNED BY:
DRAWN BY: WSB
CHECKED BY: WSB
SCALE:

PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

DRAWING TITLE: REACTOR TRAILER

REVISIONS			
NO.	DATE	BY	ACTION

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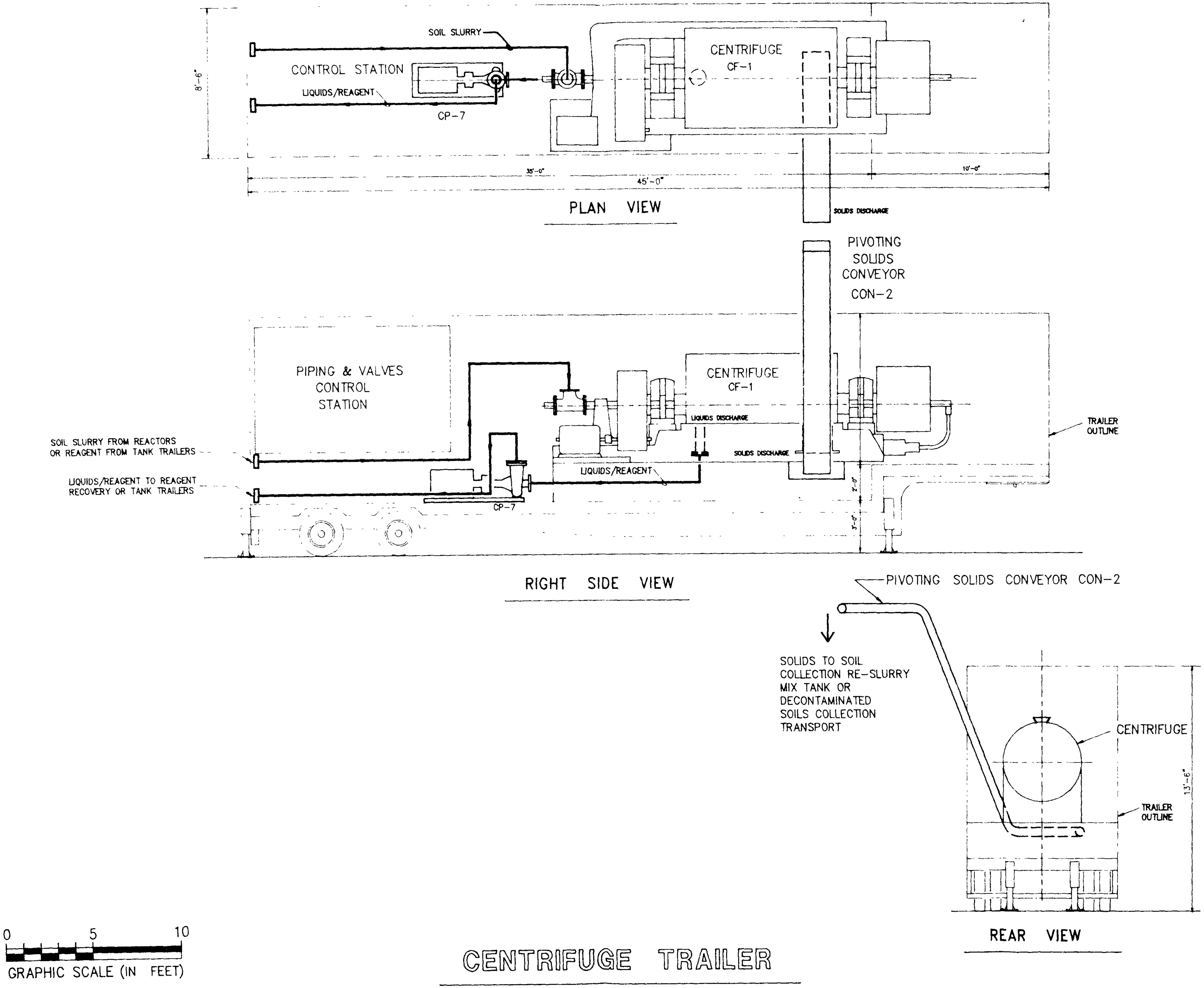

CENTRIFUGE TRAILER

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JOB NUMBER: 88-048
DATE: NOV. 30,1988
DESIGNED BY: WSB
DRAWN BY: WSB
CHECKED BY:
SCALE:

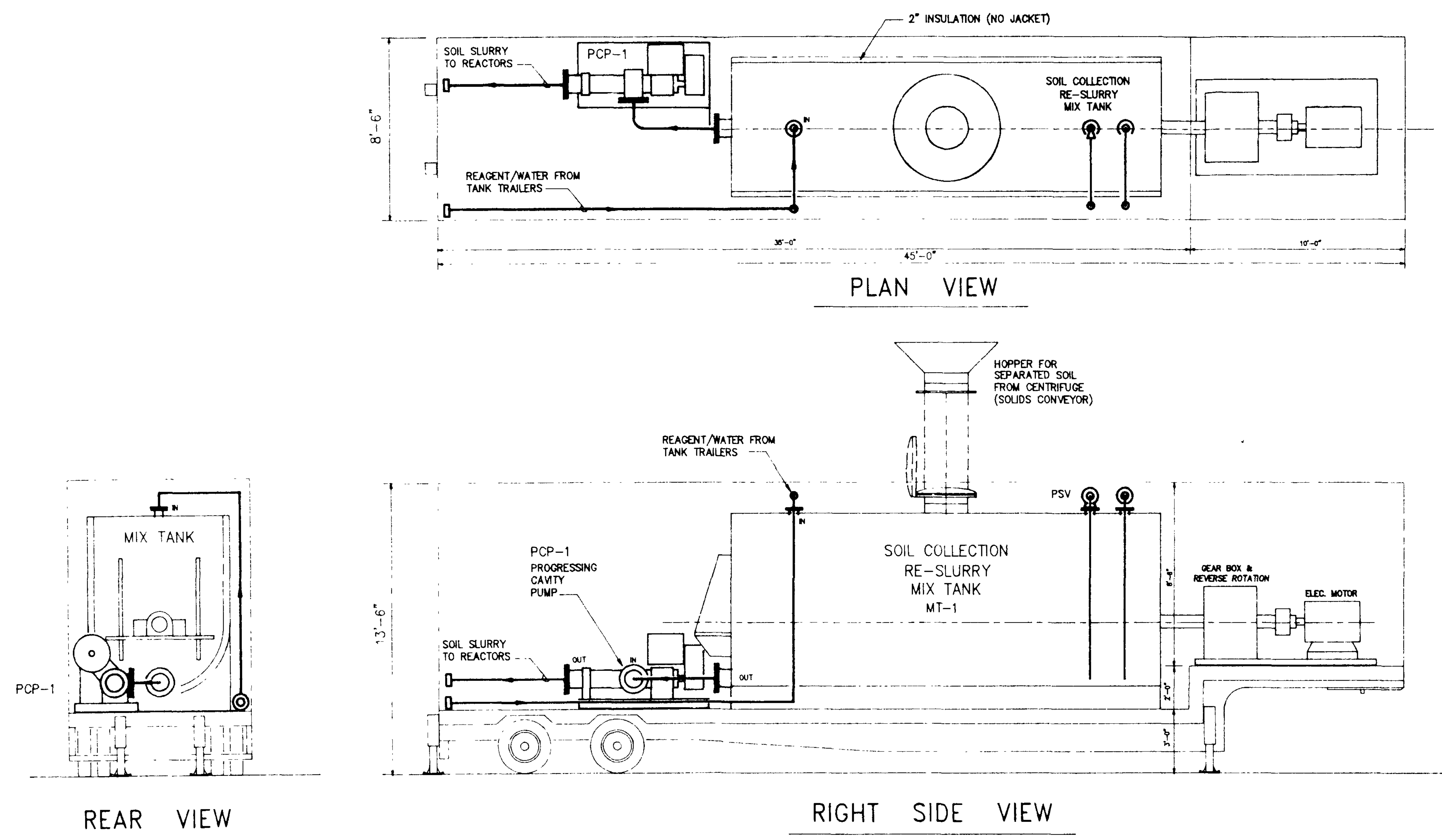
PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

DRAWING TITLE: CENTRIFUGE TRAILER

REVISIONS

NO.	DATE	BY	ACTION

C01



SOLIDS MIX TRAILER

GRAPHIC SCALE (IN FEET) 0 5 10

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Tel: (315) 437-7181

JOB NUMBER: 88-046
DATE: NOV. 30,1988
DESIGNED BY: WSB
DRAWN BY: WSB
CHECKED BY:
SCALE:

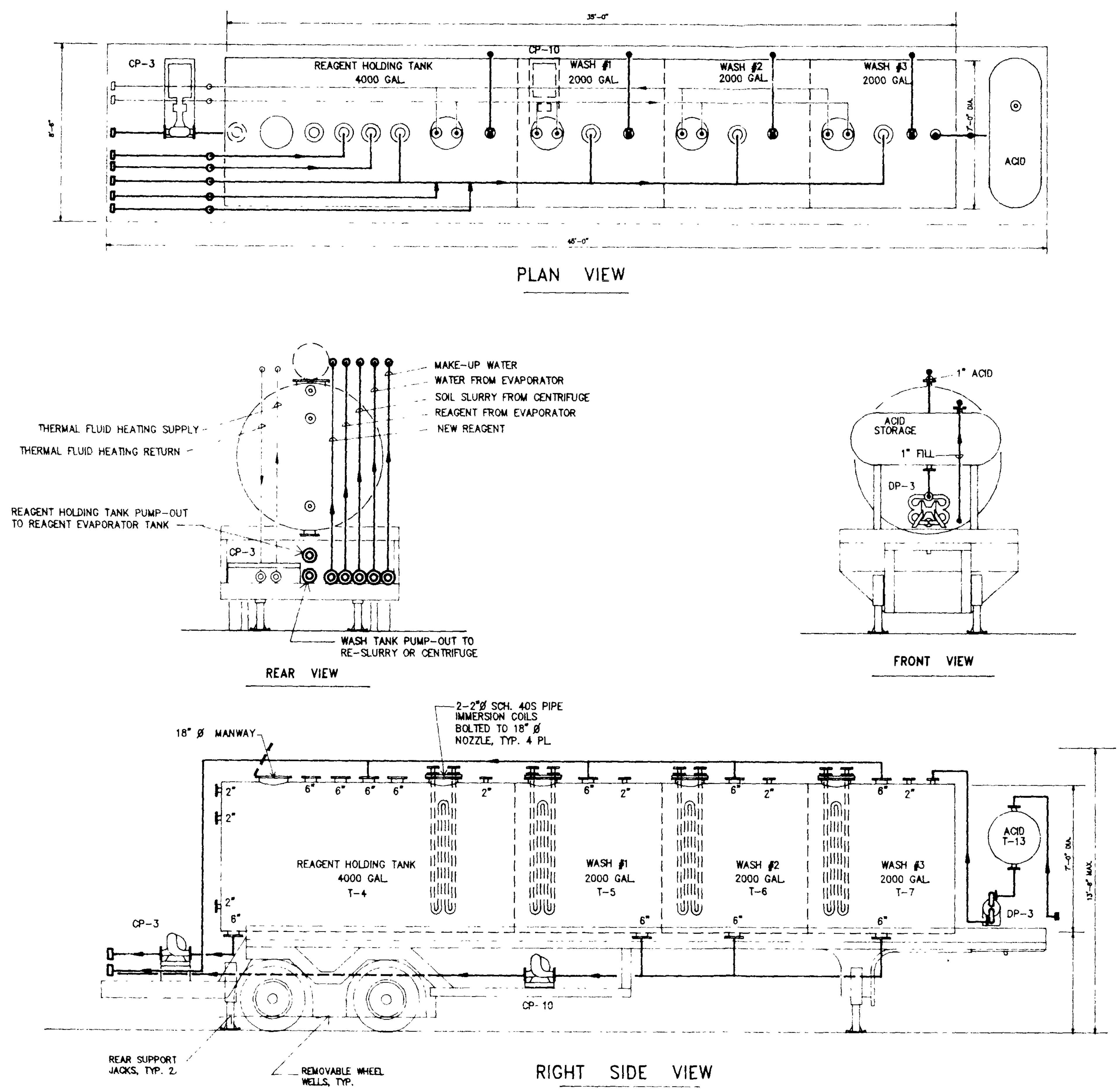
PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

DRAWING TITLE: SOLIDS MIX TRAILER

REVISIONS

NO.	DATE	BY	ACTION

SS01



TANK TRAILER (WASHES)

GRAPHIC SCALE (IN FEET) 0 5 10

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Tel: (315) 437-7181

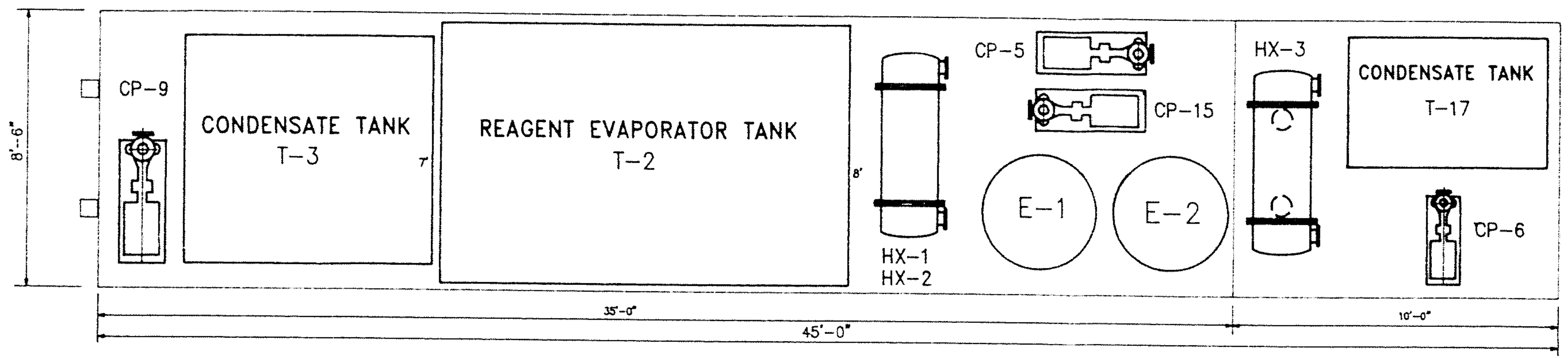
JOB NUMBER: 88-046
DATE: NOV. 30,1988
DESIGNED BY: WSB
DRAWN BY: WSB
CHECKED BY:
SCALE:

PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

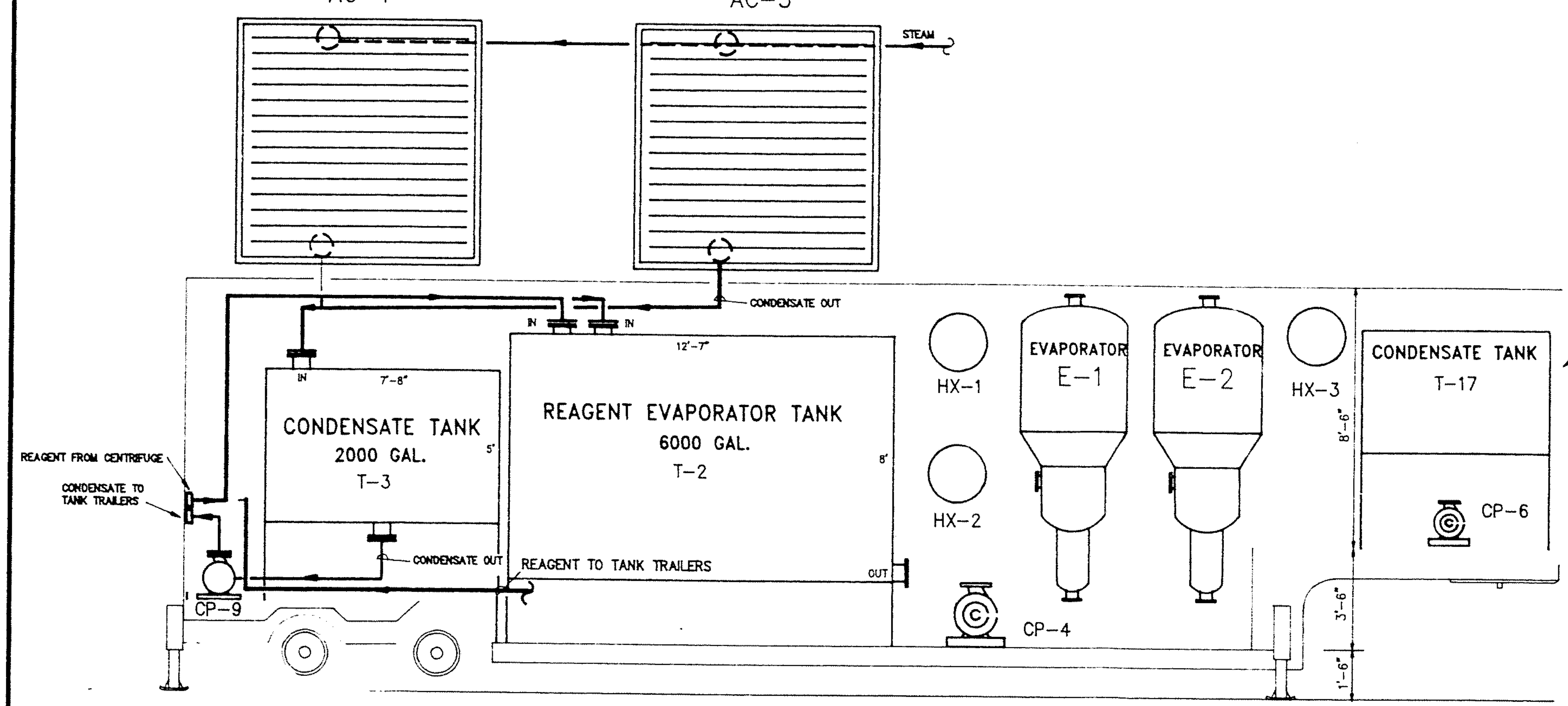
DRAWING TITLE: TANK TRAILER (WASHES)

REVISIONS

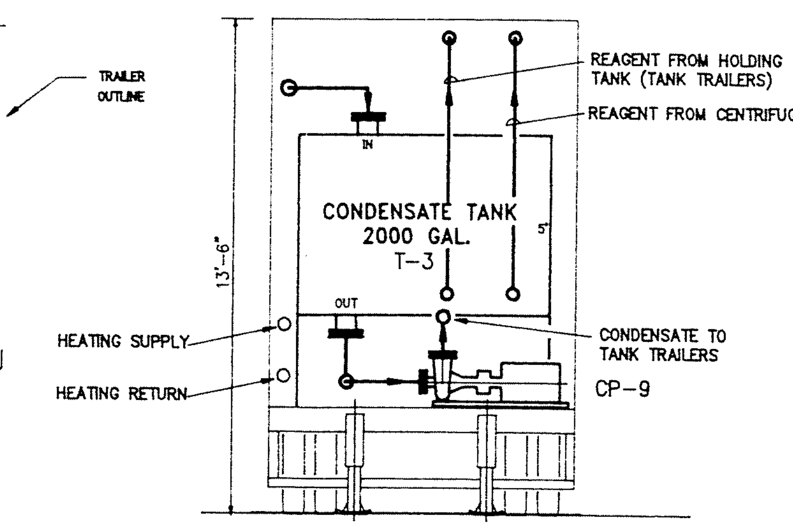
NO	DATE	BY	ACTION



PLAN VIEW

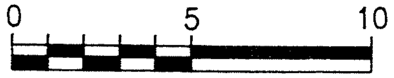


RIGHT SIDE VIEW



REAR VIEW

REAGENT RECOVERY TRAILER (EVAPORATOR)



GRAPHIC SCALE (IN FEET)

Galson
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Tel: (315) 437-7181

JOB NUMBER: 88-046
DATE: NOV. 30,1988
DESIGNED BY: WSB
DRAWN BY: WSB
CHECKED BY:
SCALE:

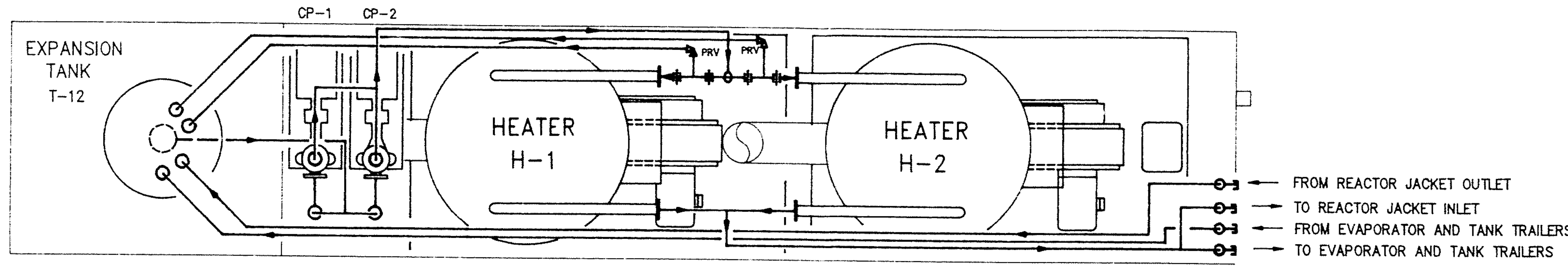
PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

DRAWING TITLE: REAGENT RECOVERY TRAILER (EVAPORATOR)

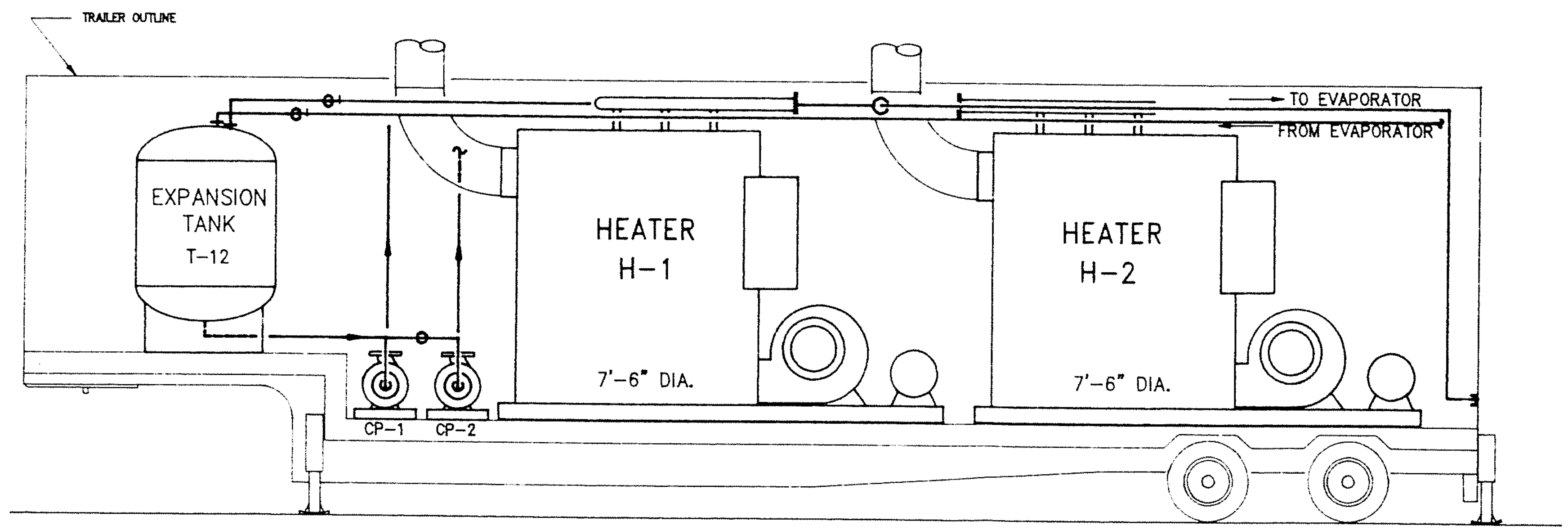
REVISIONS

NO.	DATE	BY	ACTION

RR01



PLAN VIEW



LEFT SIDE VIEW

HEATER TRAILER

2 - 10,000,000 BTUH THERMAL FLUID HEATERS

0 5 10
GRAPHIC SCALE (IN FEET)

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E. Syracuse, N.Y. 13057
Tel: (315) 437-7181

JOB NUMBER: 88-046
DATE: NOV. 30,1988
DESIGNED BY:
DRAWN BY: WSB/CSC
CHECKED BY:
SCALE:

PROJECT NAME: PCB SOILS DECONTAMINATION MOBILE UNIT

DRAWING TITLE: HEATER TRAILER

REVISIONS

NO.	DATE	BY	ACTION

HT01

4. Cost estimate and supporting documentation

4.1 Major equipment items

4.1.1 REACTOR AND ASSOCIATED EQUIPMENT

REACTORS R1, 2 ,3:

CAPACITY 100 cu. yds./ day/ reactor
Soil Decontamination Reactor w/ quick connections.
6,000-7,000 Gal., mix. 112lb/cu.ft., u H2O, Cp=0.9
Charge: 28 tons soil and 16 tons reagent , PH>13.
Operating temperature: 300 F, Operating pressure: <5 psig.
Special Stainless Steel, dimpled, half-pipe or jacketed.
400 hp Ribbon blender or agitator-full w/side wall wipe.
Maximum dimensions:
- 8 ft. wide
- 10 ft. height
- 40 ft. length

CONDENSATE TANKS T-1,8,9:

2300 Gallon capacity
Design Temp. 200 F
Design Pressure: Atmospheric
316L Stainless Steel

DIAPHRAGM PUMP: DP-2,4,5

200 GPM capacity
3" inlet and outlet ports w/quick connections.
Able to handle solids as large as 2".
All materials compatible with potassium hydroxide at 300 F.

CENTRIFUGAL PUMPS: CP-2,3,4,5,7, 11,12

200 GPM of reagent at 200 F.
316 Stainless Steel w/quick connections.

AIR COOLED CONDENSING UNITS: AC-1,2,3

Condense 6000#/Hr. of Water
44,500 CFM using 90°F Environmental Ambient Temperature
Operating Pressure Less than 5 psi.
Aluminum fins, 304 S.S. tubes, Galv. Casing & S.S. Headers.
Heat Transfer Duty = 5.6 BTU/Hr

REACTOR TRAILERS: CF-1

Drop Frame trailer
45' long x 102" wide.
Upper deck 10' x 102".
Lower deck 35' x 102".
Two axles.
100,000 lb. yield beam strength.
Air Suspension System.
Two sets of landing gear.
Completely painted w/epoxy type primer.
18 oz. vinyl tarp w/fasteners

CENTRIFUGE:

Solid Bowl (continuous)
Type 316 Stainless Steel
Provide wear protection for bowl and scroll.
Multi-ring case seal.
Circulating oil system for main bearings.
High torque gear unit.
Capacity 40 tons/hr.
100-150 HP TEFC or 150-200 HP TEFC, main drive motor.

INCLINED CONVEYOR : CON-1

Hinged Steel Plate Conveyor.
24" wide, inclined at 60 .
22' overall length.
Pivot mounting and steel wheels.
Non-powered bearing rotation.
Capacity: 120,000 lbs/hr.

S.S. CENTRIFUGAL PUMPS:

200 GPM of reagent at 200 F.
316 S.S. w/tri-clamp connections.

HIGH SPEED SCREEN:

High Speed Machine with 1/4 in. mesh screen cloth
Lubrication System.

CENTRIFUGE TRAILERS:

Drop Frame trailer
45' long x 102" wide.
Upper deck 10' x 102".
Lower deck 35' x 102".
Two axles.
100,000 lb. yield beam strength.
Air Suspension System.
Two sets of landing gear.
Completely painted w/epoxy type primer.
18 oz. vinyl tarp w/fasteners.

SOIL COLLECTION RE-SLURRY TANK: MT-1

6,000 gal. Capacity.
24 Tons Soil.
316 S.S. Construction.
Ribbon Blender or Agitator.
Maximum Dimensions:
- 8 ft. wide
- 10 ft. height.
- 40 ft. length.

PROGRESSIVE CAVITY PUMP:

500 GPM slurry at 200 F.
316 S.S.
quick connections.

SOLIDS MIX TRAILERS:

Drop Frame trailer
45' long x 102" wide.
Upper deck 10' x 102".
Lower deck 35' x 102".
Two axles.
100,000 lb. yield beam strength.
Air Suspension System.
Two sets of landing gear.
Completely painted w/epoxy type primer.
18 oz. vinyl tarp w/fasteners.

4.1.2 HEATER SYSTEM AND EQUIPMENT

Heaters: H-1,2

10,000,000 BTU /Hr. Heaters
Uses a hot oil thermal fluid for heat transfer
Has knock-down stacks for transport.
All piping is carbon steel.
Provides heat to reactor, tank and reagent recovery trailers.

CENTRIFUGAL PUMP: CP-1,2

1100 GPM capacity
Pumps hot oil at nominal temperature of 650 F from expansion tank to heaters and then to the trailers as required.

EXPANSION TANK: T-12

1500 Gallon Capacity
To provide for expansion of hot oil.
All carbon steel construction.

HEATER TRAILER:

Drop Frame trailer
45' long x 102" wide.
Upper deck 10' x 102" wide.
Lower deck 35' x 102" wide.
100,000 lb. yeild beam strength.
Two axles.
Air Suspension system.
Two sets of landing gear.
Completely painted w/epoxy type primer.
18 oz. vinyl tarp w/fasteners.

4.1.3 EVAPORATION SYSTEM

Double effect Evaporator (E-1, E-2 combination):

Produce 2000 gph distilled water
Heat source: Thermal transfer fluid at 650 F nominal temperature and maximum Q of 20MM BTUH.
304 S.S.
Design Temp. : 110 °C (tube side), Design Pressure: Atmospheric

HEAT EXCHANGER: HX-1,2 ,3(all 304 SS)

Stainless Steel Shell rated 150 psig.
Stainless Steel tubesheets rated 150 psig.
Stainless Steel liquor chamber.
Stainless Steel piping.
Stainless Steel pump.
Stainless Steel vacuum equipment.

S.S. CENTRIFUGAL PUMP: CP-5

650 GPM S.S. centrifugal pump.
220 F Reagent solution.
316 S.S.
4" inlet, 3" outlet w/adapters to quick connect fittings.

S.S. CENTRIFUGAL PUMPS: CP-6

200 GPM of condensate at 200 F.
316 Stainless Steel, w/quick connections.

S.S. CENTRIFUGAL PUMPS: CP-11

10 GPM of reagent at 200 F.
316 Stainless Steel, w/quick connections.

CONDENSATE TANK: T-3

2000 Gal. capacity, approx. 6'x8'x6'.
316 Stainless Steel.
Design Temp. : 100 C, Design Pressure: Atmospheric

AIR COOLED CONDENSING UNIT: AC-4

Condense average 8500lbs/hr. of Water
44,500 CFM using 90°F Environmental Ambient Temperature.
Operating Pressure Less than 5 psig.
Aluminum fins,S.S. Tubes, Galv. Casing & S.S. Headers
Heat Transfer Duty: max16MM Btu/Hr.

REAGENT EVAPORATOR TANK:

6,000 Gal. 316 S.S. Tank.
Quick connect type ferrules.
Approx. size 12'-7" x 8'-0" x 8'-0".

REAGENT RECOVERY TRAILER:

Drop Frame Trailer.
45'long x 102" wide.
Upper Deck 10' x 102".
Lower Deck 35' x 102".
100,000 lb. yield beam strength.
Two axles.
Air Suspension System.
Two sets of landing gear.
Completely painted w/epoxy type primer.
18 oz. vinyl tarp w/fasteners.

2000 GAL. TANKS: T-5,6,7,11,12,14

316 S.S.
Quick connect Ferrules.
16"-18" Manways.
Immersion Coils.
2" Fibreglass Insulation.
Pressure Rating: Atmospheric.
Teflon Seals.
Temp. Range: -30 - 250 F.
Heads: Dished or Flat.

4000 GAL. TANKS T-4,10

316 S.S.
Quick connect Ferrules.
16"-18" Manways.
Immersion Coils. made of 304 S.S.
2" Fibreglass Insulation.
Pressure Rating: Atmospheric.
Teflon Seals.
Temp. Range: -30 - 250 F.
Heads: Dished or Flat.

S.S. CENTRIFUGAL PUMPS CP-3,10,13,14:

200 GPM of Reagent or water at 200 F.
316 Stainless Steel w/quick connections.

ACID METERING PUMPS: DP-3

30 GPH.
Type 316 stainless steel.

ACID STORAGE TANKS: T-13

200 Gal. Capacity Carbon Steel Tank.
25 Mil Kynar PVDF Lining.
Exterior painted w/epoxy type primer.

TANK TRAILERS:

Flat Bed Trailer
45' long x 102" wide.
Two axles.
100,000 lb. yield beam strength.
Air Suspension System.
Two sets of landing gear.
Completely painted w/epoxy type primer.
18 oz. vinyl tarp w/fasteners.

4.1.4 ELECTRICAL SYSTEM AND EQUIPMENT

TWO MOTOR CONTROL CENTERS:

- MCC-1:
  - Two Size 5 auto. transformer w/c.b.
  - One Size 4 auto. transformer w/c.b.
  - Breaker 100 AF
- MCC-2:
  - Three Size 5 auto. transformer w/c.b.
  - Four Size 2 FVNR.

DISTRIBUTION TRANSFORMER

LOW VOLTAGE DISTRIBUTION BOARD

LIGHTING

DISCONNECT SWITCHES:

- One 400 Amp.
- Four 200 Amp.
- One 100 Amp.
- Four 60 Amp.
- Six 30 Amp.

PORTABLE POWER CABLE

SUBSTATION

ELECTRICAL TRAILER:

- Drop Frame Trailer.
- 45'long x 102" wide.
- Upper Deck 10' x 102".
- Lower Deck 35' x 102".
- 100,000 lb. yield beam strength.
- Two axles.
- Air Suspension System.
- Two sets of landing gear.
- Completely painted w/epoxy type primer.
- 18 oz. vinyl tarp w/fasteners.

4.1.5 EQUIPMENT LIST

PUMPS

I.D. NO.	TYPE	USE	GPM	HP	RPM	TEMP.
CP-1	CENTRIFUGAL	HEATING	1100		3600	650 F
CP-2	CENTRIFUGAL	HEATING	1100		3600	650 F
CP-3	CENTRIFUGAL	REAGENT	200	10	3600	200 F
CP-4	CENTRIFUGAL	REAGENT	200	10	3600	200 F
CP-5	CENTRIFUGAL	REAGENT	650	20	3600	200 F
CP-6	CENTRIFUGAL	CONDENSATE	200	10	3600	200 F
CP-7	CENTRIFUGAL	REAGENT	200	10	3600	200 F
CP-8	CENTRIFUGAL	CONDENSATE	200	10	3600	200 F
CP-9	CENTRIFUGAL	CONDENSATE	200	10	3600	200 F
CP-10	CENTRIFUGAL	WASH WATER	200	10	3600	200 F
CP-11	CENTRIFUGAL	CONDENSATE	200	10	3600	200 F
CP-12	CENTRIFUGAL	CONDENSATE	200	10	3600	200 F
CP-13	CENTRIFUGAL	REAGENT	200	10	3600	200 F
CP-14	CENTRIFUGAL	REAGENT	200	10	3600	200 F
CP-15	CENTRIFUGAL	REAGENT	10	1	3600	200 F
DP-1	DIAPHRAGM	REAGENT	25	AIR	N/A	AMBIENT
DP-2	DIAPHRAGM	REACTION	200	AIR	N/A	300 F
DP-3	DIAPHRAGM	ACID FEED	0.5	1/6	N/A	AMBIENT
DP-4	DIAPHRAGM	REACTION	200	AIR	N/A	300 F
DP-5	DIAPHRAGM	REACTION	200	AIR	N/A	300 F
DP-6	DIAPHRAGM	ACID FEED	0.5	1/6	N/A	AMBIENT
PCP-1	PROG. CAVITY	REACTION	500	40	300	200 F

TANKS

T-1	316L S.S.	CONDENSATE	2300	7'D x 8'6"L
T-2	316 S.S.	REAGENT EVAP.	6000	12'7" x 8' x 8'
T-3	316 S.S.	CONDENSATE	2000	7'8" x 5' x 7'
T-4	316 S.S.	REAGENT HOLDING	4000	7'D x 14'L
T-5	316 S.S.	REAGENT WASH	2000	7'D x 7'L
T-6	316 S.S.	REAGENT WASH	2000	7'D x 7'L
T-7	316 S.S.	REAGENT WASH	2000	7'D x 7'L
T-8	316 S.S.	CONDENSATE	2300	7'D x 8'6"L
T-9	316 S.S.	CONDENSATE	2300	7'D x 8'6"L
T-10	316 S.S.	REAGENT HOLDING	4000	7'D x 14'L
T-11	316 S.S.	REAGENT WASH	2000	7'D x 7'L
T-12	C.S.	EXPANSION	1500	4' x 8' x 6'
T-13	C.S.	ACID STORAGE	200	
T-14	316S.S.	REAGENT WASH	2000	7'D x 7'L
T-15	316S.S,	REAGENT WASH	2000	7'D x 7'L
T-16	C.S.	ACID STORAGE	200	
T-17	316 S.S.	CONDENSATE	2300	7'D x 8'6"L
MT-1	316 S.S.	RE-SLURRY MIX	6000	20' x 8' x 6'

MOTORS

SERVICE	HP		VOLTAGE	PHASE	SERVICE
CP-1	10		480	3	HEATING
CP-2	10		480	3	HEATING
CP-3	10		480	3	REAGENT
CP-4	10		480	3	REAGENT
CP-5	10		480	3	REAGENT
CP-6	10		480	3	CONDENSATE
CP-7	10		480	3	REAGENT
CP-8	10		480	3	CONDENSATE
CP-9	10				CONDENSATE
CP-10	10				WASH WATER
CP-11	10				CONDENSATE
CP-12	10				CONDENSATE
CP-13	10				REAGENT
CP-14	10				REAGENT
CP-15	1				REAGENT
DP-1	40		480	3	REAGENT
DP-3	1/6		120	1	ACID FEED
7 1/2	SOLIDS	480	3	CONVEYOR	
125	DIAPH PUMPS	480	3	AIR COMPRESSOR	
40	CU=1	480	3	AIR COOLED CONDENSER	
40	CU-2	480	3	AIR COOLED CONDENSER	
40	CU-3 (A,B,C)	480	3	AIR COOLED CONDENSER	
150	H/R	480	3	REACTOR	
200	CF	480	3	CENTRIFUGE	
150	RS	480	3	MIX TANK	

4.2 Budgetary cost estimate

Cost Estimate - Wide Beach Site

		Page	1	of	3		
	Quantity		Labor		Material		
Summary	# units	unit	per unit	total	per unit	total	Total Cost
Equipment and assembly costs							
Reactors	3	each			$505,000	$1,515,000	
Centrifuge	1	each			$450,000	$450,000	
ReSlurry Tank	1	each			$460,000	$460,000	
Evaporator	1	each			$250,000	$250,000	
Heaters	2	each			$85,000	$170,000	
Tank Trailers	2	each			$66,000	$132,000	
Air Coolers	5	each			$38,000	$190,000	
Air Compreser	1	each			$27,000	$27,000	
							$3,194,000
SS Piping & Valving						$82,000	
CS Piping & Valving						$28,400	
Eng/Insp/Procurement						$349,100	
Field Labor, Mech Inst	6120	hours	$25	$153000		$160,000	
Field Supervision						$48,000	
Instrumentation						$101,000	
Steel, Eqpt support, Walkways						$30,000	
Stack, self supporting						$10,000	
200 gpm centrif. pump	11	each			$1,936	$21,296	
650 gpm centrif. pump	1	each			$2,580	$2,580	
200 gpm Diaph. Pumps	3	each			$4,800	$14,400	
500 gpm Diaph. Pumps	1	each			$36,000	$36,000	
30 gph Diaph. Pumps	1	each			$1,300	$1,300	
Heater pumps	2	each			$5,500	$11,000	
Tankage: 200 gal	2	each			$6,150	$12,300	
2000 gal	1	each			$18,000	$18,000	
6000 gal	1	each			$24,600	$24,600	
1500 gal	3	each			$17,000	$51,000	
Motors: 150 hp	4	each			$22,500	$90,000	
Motor Control Center	2	each				$68,000	
Substation, inc. interconnects metering						$75,000	
Low Voltage Transformers						$4,250	
Electrical Lighting, Grounding, Power Distribution						$30,000	
Conveyors	2				$28,000	$56,000	
Trailers	8				$20,264	$162,112	
Weather Protection -tenting						$44,000	
Insurance, Construction						$25,000	
Freight						$25,000	
Insulation & Painting						$5,000	
Tax						$3,500	
							$1,930,468
Total equipment and assembly costs							$5,124,468

Wide Beach Cost Estimate

		Page	2	of	3		
	Quan	tity	Lab	or	Mate	rial	
Summary	# units	unit	per unit	total	per unit	total	Total Cost
ASSUMPTIONS							
2 ppm cleanup level							
19000 yards of soil (21000 tons) to be processed							
Processing schedule 365 days/yr							
Nominal processing rate 90 yards/batch (3 reactors at 30 yards each)							
estimated cycle time 12 hours							
processing 24 hours/day							
estimated 70% processing time (30% downtime)							
depreciation, 20% of capital cost							
maintenance costs, 30% of capital$/year, 1/3 year operation = 10% of capital for maintenance							
capital cost, $5,124,468 (see previous sheet)							
average electrical motor usage 980 hp							
electric power costs $0.1/kW-hr							
average 20% soil moisture level							
fuel oil costs, $10/million btu	$10						
salaries, $/hour							
field manager (4 required)	$22.0	(on all shifts)					
field operator(4 required)	$15.0	(on all shifts)					
chemist(2 required)	$17.0	(12 hour day shift only)					
1. reagent							
potassium hydroxide	1,470,000	lbs			$0.17	$249,900	
Dowanol TMH	357000	lbs			$0.57	$203,490	
PEG 400	357000	lbs			$0.61	$217,770	
DMSO	714000	lbs			$0.82	$585,480	
total reagent cost	2898000	lbs					$1,256,640
2. waste disposal	65000	lbs			$0.22	$14,300	$14,300
Waste disposal is primarily of spent reagent at the conclusion of the project, which is incinerated as "PCB"							
to avoid regulatory problems							
3. fuel costs	38000	MM btu			$10	$380,000	$380,000
4. Electric power	2600000	kW-hr			$0.10	$260,000	$260,000
5. Soil screening unit rental	1	month			$5,000	$5,000	$5,000
6. field labor							
field manager	3600	hours	$22	$79,200			
chemist	1800	hours	$17	$30,600			
field operator	3800	hours	$15	$57,000			
total labor costs	9200						$166,800
Total costs this page							$2,082,740

Wide Beach Cost Estimate

Summary	Quantity # units	Quantity unit	Labor per unit	Labor total	Material per unit	Material total	Total Cost
7. Per diem	767	days			$75	$57,500	
8. personal protective equipment	617	days			$45	$27750	
This figure is based on experience at other sites							
9. travel, Syracuse to/from WB	110	trips			$100	$10,952	
This assumes that this project will be staffed out of a Syracuse office or other within 200 miles of the site, driving at $0.25/mile							
10. depreciation	1	proj.			$1,024,894	$1,024,894	
11. maintenance	1	proj.			$512,447	$512,447	
subtotal							$3,716,283
allocated home office overhead costs at 10% of project costs							$371,628
subtotal							$4,087,911
Supervision and Administration (8%)							$327,033
subtotal							$4,414,944
contingency (10%)							$441,494
subtotal							$4,856,438
Profit (15% of total cost)							$728,466
Estimated total project cost cost							$5,584,904

Appendix 1 - Supporting documentation, venders literature and cost quotations

EAGLE SALES, INC.
MATERIAL HANDLING SYSTEMS AND PRODUCTS

106 BOSS ROAD
SYRACUSE, N.Y. 13211
TELEPHONE 315-463-1113

TO: GALSON & GALSON ENGINEERS P.C. Attn. Gary Hobbs

RAPIDFAX NO: 315-437-0509

LOCATION: EAST SYRACUSE NY.

FROM: EAGLE SALES INC. FAX. NO. 1-315-463-1603

LOCATION: SYRACUSE, NEW YORK

NO. OF PAGES TO FOLLOW: -

SENT BY: BARRY MAYNARD

DATE: 8-26-88

NOTES:

HINGED STEEL BELT CONVEYOR 24" W.
INCLINED AT 60°, 22-0" LG O/A. WITH
PIVOT MOUNTING & STEEL WHEELS,
(NON POWERED ROTATION).

BUDGET FIGURE $28,000.00

FILE # E08-29-GG.

PROCESS SYSTEMS & EQUIPMENT
Division of Lee Industries, Inc.
P. O. Box 687
Philipsburg, Pennsylvania 16866
(814) 342-0470 TLX 81-2386
FAX: (814) 342-5660

RECEIVED
OCT 20 1988
GALSON COMPANIES

Galson & Galson
6601 Kirkville Road
East Syracuse, NY 13057

ATTN: Jim Morrison

PROPOSAL NUMBER: 6945

DATE: October 13, 1988

SPECIFICATIONS	PRICE

Dear Jim:

In response to your request for quotation, we wish to submit the following proposal for your consideration. We quote as follows:

(3) - 7000 GALLON HORIZONTAL BLENDER WITH DOUBLE RIBBON AGITATOR

DIMENSIONS:	96" deep x 96" wide x 240" long
DESIGN:	5 PSIG pressure internally 100 PSIG pressure in jacket
SHELL:	T-316 S.S.
JACKET:	T-304 S.S. Uniflow coil jacket with T-304 S.S. sheath
CODE:	1986 A.S.M.E. with National Board Inspection, Stamping and Registration
FINISH:	Mill finish inside and outside with welds wire brushed
AGITATION:	Double ribbon agitator powered by a 400 H.P., 230/460 volt, 60 cycle, 3 phase motor with soft start motor starter giving agitator speed of 15 RPM. Agitator is direct drive
COVER:	T-316 S.S. flat cover with (4) charge ports
OUTLET:	(1) 10" flange outlet
SUPPORT:	Blender supported by carbon steel I-beams. Blender to be designed for permanent mounting on flat bed truck trailer. All carbon steel supports and bearing plates will be painted.

F.O.B. Philipsburg, PA........................ $505,000.00 ea.
BUDGET PRICE

"SUBJECT TO CONDITIONS ON REVERSE SIDE"

OPTION: Deduct for blender without steam jacket.................... $ 45,000.00 ea.

SHIPMENT: Determined at time of order placement.

Shipment is based upon receipt of approved prints from customer; however, should shipment be required prior to this schedule, please contact the writer (814) 342-0470 to determine if your requirements can be met.

The above delivery is based upon customer approval to order special material at time of order placement.

TERMS: 1/3 with order placement; 1/3 at shipment; 1/3 Net 30 days

Prices are subject to review after 30 days. Due to the current fluctuation of stainless steel prices, we reserve the right to review prices at time of order placement. All orders, contracts and quotations are submitted contingent upon occurrence of strikes, accidents, fire, riots, war, acts of God, and any other causes beyond our control. In the event of strikes in our plants or in the plants of our suppliers, we may withdraw this proposal if, in our opinion, such strikes will result in the following:

1. Delay in the delivery of materials and supplies.
2. Cancellation by suppliers of materials and supplies.
3. Increased prices for materials, supplies, and labor.

The Process Systems & Equipment Regional Office for your area is operated by our Regional Engineering Manager, Mr. Greg Wharton. If the need arises for any specific or general information about our products, please do not hesitate to contact Greg or the factory direct.

We wish to thank you for the opportunity of submitting our quotation, and hope to be favored with an order.

PROCESS SYSTEMS & EQUIPMENT

William H. Spicker
Applications Engineer

WHS:bd

cc: Greg Wharton
12 Fortune Road East
Middletown, NY 10940
(914) 692-8038

PROCESS SYSTEMS & EQUIPMENT
Division of Lee Industries, Inc.
P.O. Box 687, Philipsburg, Pa. 16866
(814)342-0470 TLX 81-2386

Dear Valued Customer:

In order to serve you more efficiently, we have recently purchased a Facsimile Machine to send and receive documents over the telephone lines. Our phone number for the Fax Machine is (814) 342-5560.

Should your company have a Facsimile Machine, please complete the information asked for below and return it to us at your convenience.

Thank you for your time.

Sincerely,

PROCESS SYSTEMS & EQUIPMENT
DIVISION OF LEE INDUSTRIES, INC.

* *

COMPANY NAME ______________________________

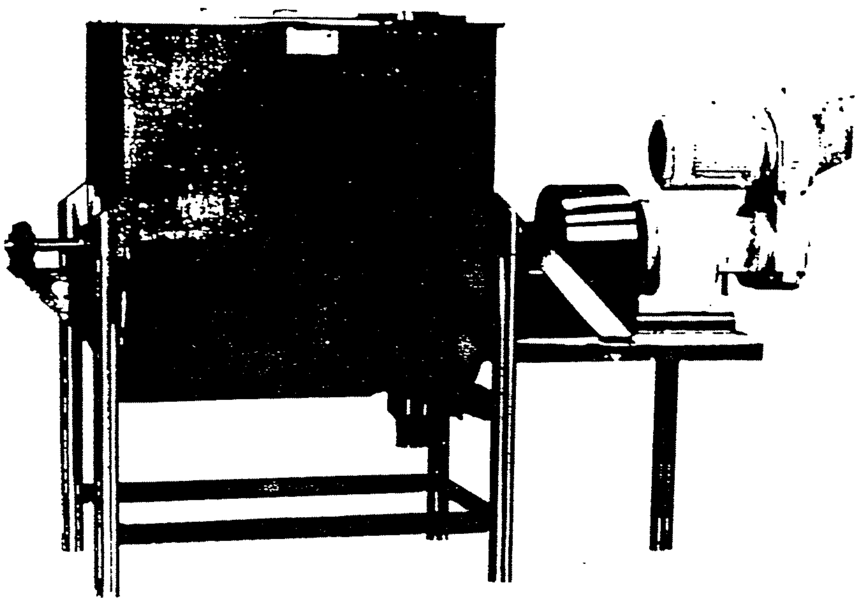
ADDRESS ______________________________

____

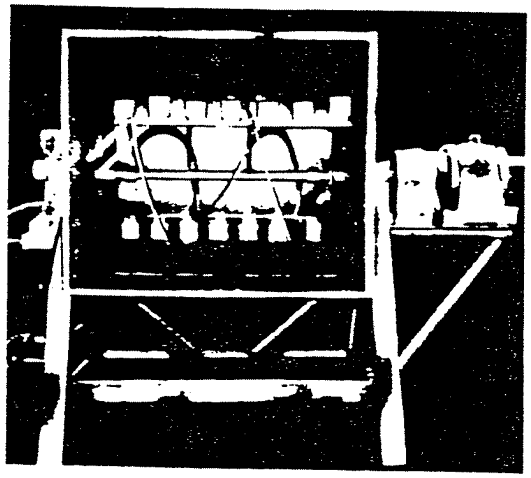
FAX NUMBER ______________________________

MIXERS AND BLENDERS

LEE PROCESS SYSTEMS & EQUIPMENT



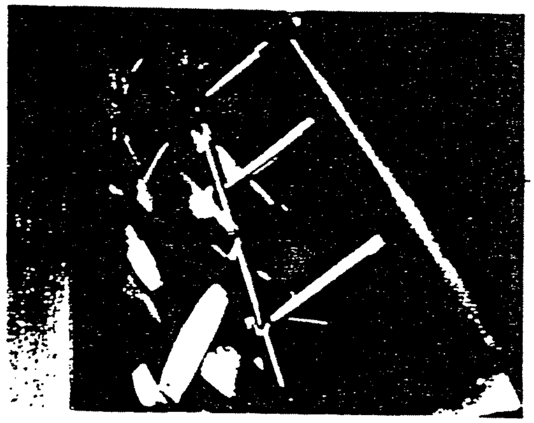
Style TPRS - Paddle style horizontal blender for use in a chopped clam/oil mixing operation, ready for shipment at the Lee manufacturing facility.



Style TDRS - double ribbon agitator provides excellent two-way mixing for free flowing solids and heavy slurries. Scraped surface features positive action to bottom area of blender. All standard blenders are available with optional hydraulic tilt. (See Case Study #1.)

Lee Horizontal Blender

This popular blender is available in capacities from 25 to 5000 gallons with a wide choice of agitator styles - single or double ribbon, paddle, or bar - all available with scraped surface. Agitators can be selected for a lifting, folding, or cross-blending action. Process Systems and Equipment's horizontal blenders have a completely clean interior with large radiused corners. USDA-MID approved agitators and sanitary shaft seals are standard and a wide variety of outlets are available, including the Fluid Transfer USDA-MID approved flush-type ball valve. Insulated heating and/or cooling jackets are optional for all units. The "Uniflow" jacket is utilized for operating pressures up to 250 PSI and provides extremely efficient heat transfer. Jacketed blenders are standard with 1½" of insulation and a 304 stainless steel sheath with product contact parts available in either 304 or 316 stainless steel. Although a #4 finish is standard, a wide range of finishes is available from #2B through the Lee #7. Stainless steel tubular legs and cover are standard, but units can be suspended or trunnion mounted. Products handled range from talcum powder to barbecue sauce, salad dressing to sausage.

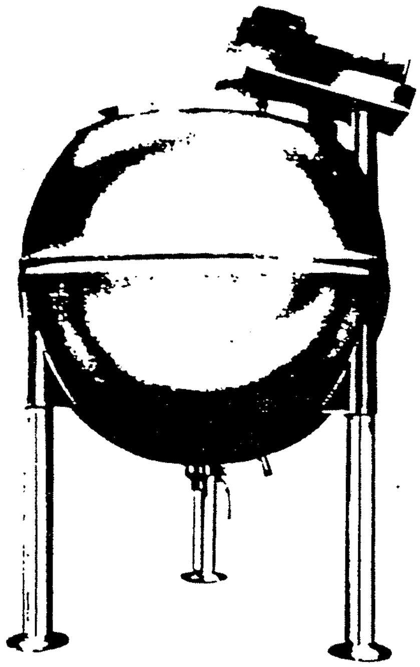


Style TPR - Paddle agitation is effective for mixing slurries and providing excellent top to bottom mixing. (See Case Study #2.)

Specifications

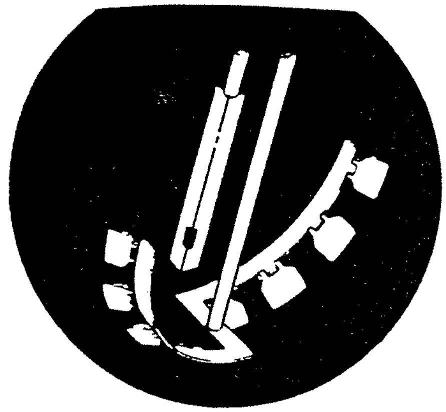
Nominal Capacity		Working Capacity		Inside Dimensions			Overall Height	Distance Outlet to Floor	Diameter Outlet	Variable Speed (RPM)	Floor Space	Motor H.P.		Crated Weight (Lbs.)
Gallons'	Cu. Ft.	Gallons	Cu. Ft.	Width	Length	Depth						35 Lbs./Ft.³	60 Lbs./Ft.³	
50	6.7	40	5.3	20"	24"	32"	51	16"	1½"	10-30	24" x 45"	1½	2	865
100	13.4	70	9.5	24"	30"	40"	59	16"	2"	10-30	28" x 51"	2	3	1060
150	20.0	135	18	30"	36"	40"	59	16"	2"	10-30	34" x 57"	3	5	1255
200	26.7	180	24	30"	48"	40"	59	16"	2"	10-30	34" x 69"	5	7½	1460
300	40	250	34	36"	48"	48"	68	16"	3"	10-30	40" x 69"	7½	10	1655
400	53.4	350	47	42"	48"	54"	74	16"	3"	10-30	46" x 69"	10	15	1850
500	67	450	61	48"	48"	59"	79	16"	3"	10-30	52" x 69"	10	15	2280
800	107	800	107	52"	72"	59"	79	16"	3"	10-30	58" x 93"	15	20	2975
1000'	134	1000	135	54"	84"	61"	81	16"	3"	10-30	60" x 105"	20	30	3580

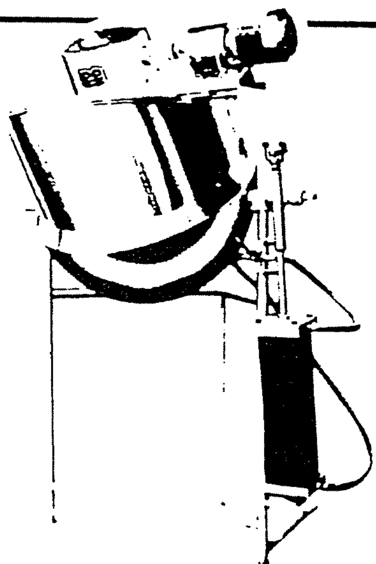
'Includes 4" Freeboard



Spherical Blender
Style D7S

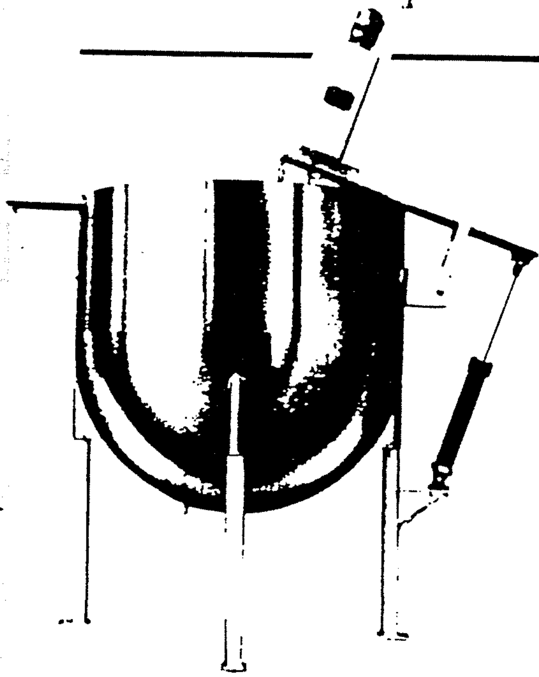
This unit is specifically designed for blending liquids and particles of varying density. The spherical design of this agitator insures that light or heavy particles are folded into the liquid. The agitator is inclined so that it provides a folding, rolling action rather than stirring the product. This unit works very well when blending heavy bodied products. Standard capacities range from 25 to 1,000 gallons. This unit is USDA-MID approved. (See Case Study #5.)





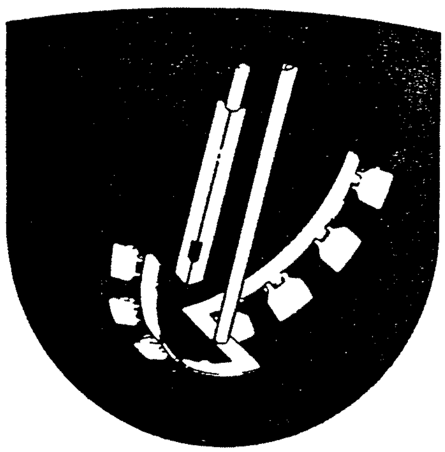
Inclined Trunnion Mixer
Style CJ9MH

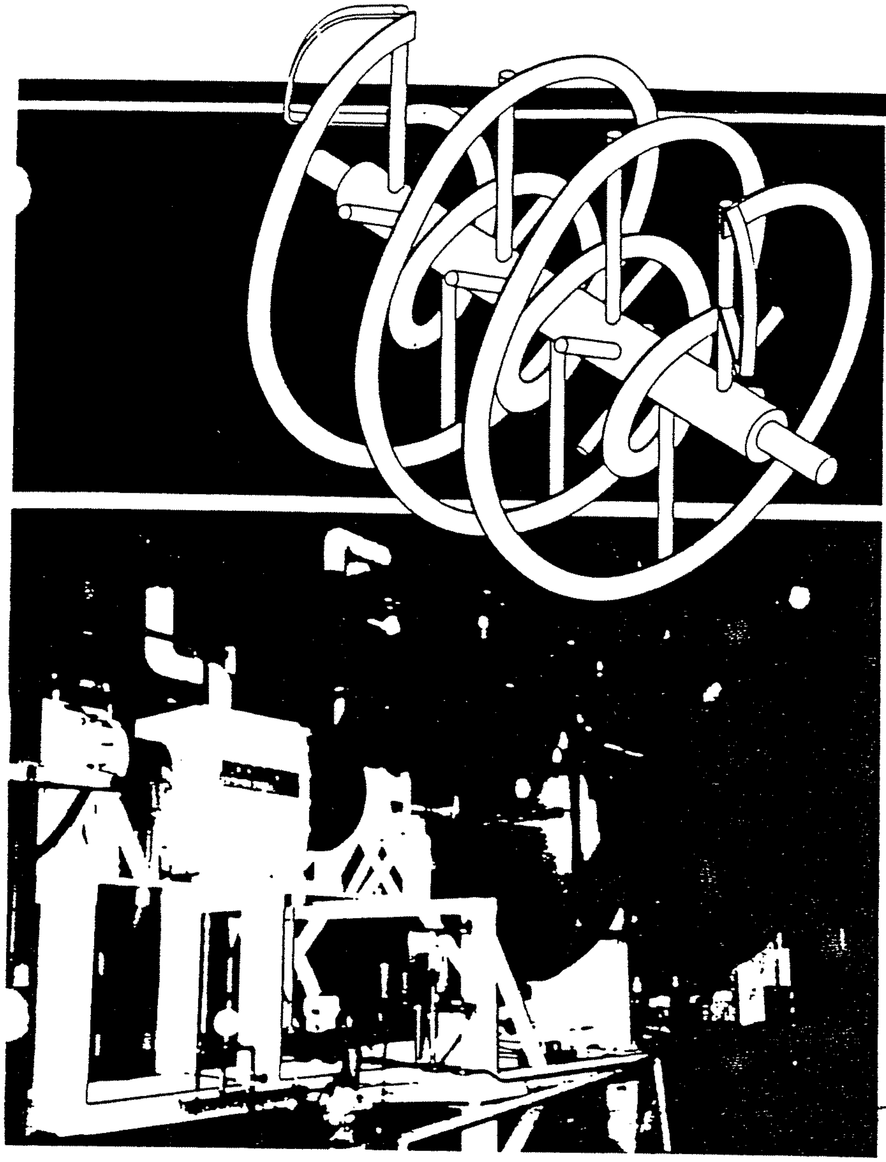
This unit is designed for double motion inclined blending. Heavy and viscous products are readily mixed by a counter-rotating scraped surface agitator. The entire unit is trunnion mounted, allowing agitation to continue while the product is being discharged. This assures complete dispensing. Standard capacities range from 25 to 500 gallons. This unit is USDA-MID approved.



Inclined Mixer
Style D7T

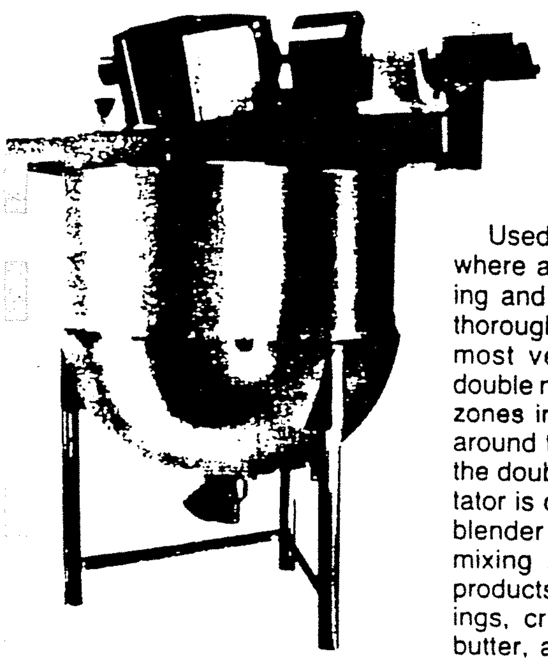
This unit is designed to blend products gently, but thoroughly. The inclined design provides complete mixing from top to bottom without damaging important particle integrity. Hydraulic tilt is available to provide ease of cleaning. Standard capacities range from 25 to 1,000 gallons. This unit is USDA-MID approved.





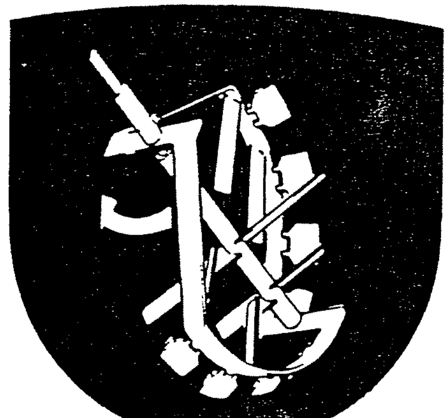
Double Ribbon Horizontal Blender
Style UTDR

This custom designed vacuum/pressure double ribbon blender has a full capacity of 4,950 gallons and a 2,650 gallon working capacity. Specially designed to decaffeinate whole, raw coffee beans, the vessel and agitator feature a sanitary #4 finish on all product contact parts. The unit is designed for full vacuum and 75 PSIG internally. The sidewall jacket can be designed in excess of 100 PSIG. The heavy-duty double ribbon agitator features a 12" diameter shaft and mechanical shaft seals. This vessel includes a special piping manifold system with sanitary Lee Fluid Transfer Ball Valves. The manifold is used for special treatment and cleaning of the product. The double ribbon agitator is powered by a 50 H.P., explosion-proof motor with an explosion-proof operator's station giving agitator speeds of 3-25 RPM. The vessel is jacketed on the sidewall to product level with the highly efficient Lee Uniflow jacket. The Lee Uniflow jacket can be used for both steam heating and water cooling.



Double Motion Inclined Mixer
Style D9MS

Used for those special applications where a combination of gentle blending and folding is needed along with thorough mixing, this unit is one of the most versatile styles. The inclined double motion agitator eliminates dead zones in the middle of the batch and around the center shaft. The action of the double motion counterrotating agitator is combined with that of a gentle blender to give complete yet gentle mixing and blending. High viscosity products such as ground meat, dressings, creams, lotions, stews, peanut butter, and potpie have all been successfully mixed in this vessel.



Centerline scraping and 4" flush bottom ball valves assure complete discharge of even large particle sizes. Just one example of this application, successfully done, is burrito fillings. For total yet gentle blending and mixing of your product, ask for Lee's Double Motion Inclined Mixer, Style D9MS.

Company History

During its 60 year history of continuous manufacturing operations, Lee Industries, Inc. has grown from a fabricator of metal parts, to a designer/manufacturer of complete processing systems. Lee Industries started in business in 1927, producing the first nickel kettles, a manufacturing innovation at the time. Lee equipment is in service throughout the world in major food processing, cosmetic, drug and chemical industries. In 1935 Lee introduced the first offset centerline scraper agitators and in 1938 the first stainless steel kettle for the food processing industry.

Throughout its history, Lee has always demonstrated innovative design and engineering expertise. This, combined with quality craftsmanship has made Lee a leader in the stainless steel processing equipment field.

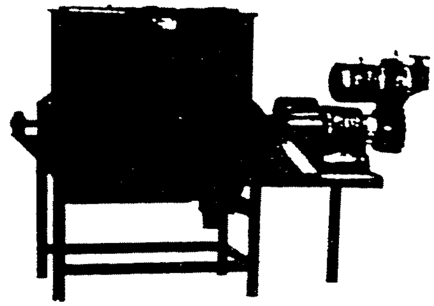
In the early 1970's Lee developed the initial designs for the many different types of blenders represented in this bulletin. Like all Lee standard process equipment, USDA-MID approval was given to every blender model. In 1976, to provide a more personalized customer service, Process Systems and Equipment was formed as a Division of Lee Industries, Inc. Process Systems and Equipment has a well organized chain of representatives throughout the United States, who will be happy to help you when your needs demand the finest in stainless steel processing equipment. For the name of the representative in your area or for any special application information, please contact Process Systems and Equipment at the address or telephone number given on the back page of this brochure.

Case Studies demonstrating the versatility of Lee's Mixers and Blenders

Case #1

Solids Blending (Style TDRS Horizontal Blender)

Double Ribbon Agitation is used for the blending of free flowing solid particles. Counterflow inner and outer ribbons push the product in opposite directions while scraper blades lift the product from the bottom of the blender to assure thorough mixing. Applications for double ribbon agitation include fine powders, spices and granulated products. Some competitive advantages of double ribbon agitation are low capital cost, safety, ease of cleaning and low maintenance costs.



Fully "Uniflow" jacketed style blender with insulation and stainless steel sheathing.

Case #2

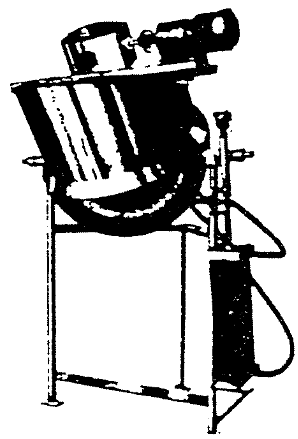
Slurry Blending (Style TPR Horizontal Blender)

Tilting paddles provide a lifting action for products such as viscous sugar and corn syrup. Paddle design is especially effective when the product is highly viscous or has a high concentration of solids. Applications include candy coating mixes, corned beef hash, sausages and pet foods. Two advantages of tilting paddles are durability and ease of cleaning.

Case #3

Meat Braising Agitator (Style CJ9MH Inclined Trunnion Mixer)

This Lee agitator has seen repeated applications for meat braising and browning. Stew meat chunks, ground meat, onions, and other particulate products are effectively braised while subjected to double motion agitation. The hydraulic tilting agitator is easily controlled while decanting excess liquid fats. The product can be poured out or additional ingredients added and processed in the same unit.

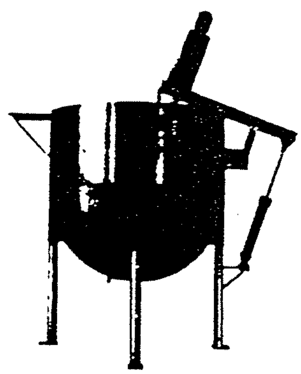


Style CJ9MH agitator with hydraulic tilting kettle.

Case #4

Fragile Products Blending (Style D7T and D9MS Inclined Mixer)

Inclined Agitation provides a folding, rolling action which makes it perfect when the application demands thorough, but gentle mixing. The product can be blended while maintaining particle integrity. Some examples of fragile products that are successfully mixed using inclined agitation are pasta, burrito filling, beans and franks, southern barbeque, bean soup, Pennsylvania Dutch "potpie," noodles and beef stew. These units can be provided with a hydraulic tilt.



Style D7T agitator tilts out hydraulically for ease in cleaning. Notice the hydraulic drive motor and agitator tilt.

Case #5

Fragile Products Blending (Style D7S Spherical blender)

Spherical Configuration is another method of blending fragile products. It can be employed when blending various particles into a viscous liquid. Due to its spherical design complete folding in action is assured. Specific applications for Spherical Configuration blending are fruit pie fillings, stews, relishes and cookie mixes.

LEE Process Systems & Equipment
Division of Lee Industries, Inc.
P.O. Box 687, Philipsburg, PA 16866
FAX: (814) 342-5660 TLX: 81-2386
Phone: (814) 342-0470

514 West Pine

Fulton

Fulton Thermal Corporation

Port and Jefferson Streets
Box 257
Pulaski, New York, USA 13142
Phone: (315) 298-6597
Telex: 646819 FULBOLWKS
Telefax: (315) 298-6390

August 5, 1988

Mr. William Beal
GALSON & GALSON
6601 Kirkville Rd.
E. Syracuse, NY 13057

RE: Our Quotation No. 88FTC-1846

Dear Mr. Beal:

In response to your phone call of today, we are pleased to submit the enclosed quotation for two Fulton Thermal Fluid Heaters, Model No. FT-1200-C.

Through years of experience in the heat transfer field, we are able to offer you the latest design in thermal fluid heaters and can assist you in the engineering of almost any application.

Our heaters are presently installed in many installations throughout the United States and overseas, serving many applications with great success.

Should you decide to utilize our equipment, I will be glad to visit your office and coordinate all technical aspects of our equipment with yours for a satisfactory installation.

Enclosed for your evaluation is literature on the Fulton Thermal Fluid Heater, a blueprint of the proposed heater and a brochure on the proposed Allweiler pump.

If you need any further assistance, please do not hesitate to call.

Very truly yours,

Claude Dupenloup
Manager,
Industrial Sales & Engineering

CD:mc

Encs.

Fulton

Fulton Thermal Corporation

Port and Jefferson Streets
Box 257
Pulaski, New York, USA 13142
Phone: (315) 298-6597
Telex: 646819 FULBOLWKS
Telefax: (315) 298-6390

CO. NAME & ADDRESS: GALSON & GALSON
6601 Kirkville Rd.
E. Syracuse, NY 13057

If the attached quotation becomes a firm order, we request that this credit reference form be completed and returned with your purchase order.

CREDIT REFERENCE FORM

Re: Quotation No. 88FTC-1846

A. List four credit references complete with addresses and telephone numbers:

1.) 3.)

2.) 4.)

B.) List the requested information regarding your main bank:

1.) NAME & ADDRESS OF BANK:

2.) CONTACT:

3.) PHONE NUMBER:

12,000,000 Btu/hr.

Two (2) each Model FT-1200-C, self supported vertical Fulton Thermopac Liquid Phase Thermal Fluid Heaters, No. 2 oil fired, modulating burner, ~~12,000,000~~ Btu/hr. net output, FM controls, complete with control panel and all required safety devices for a maximum operating temperature of 650 Deg. F, flow rate 660 GPM. 460/60/3 motor voltage; 120/60/1 control voltage....

NOTE #1: All heaters are manufactured to the ASME Code, Section I, inspected and certified. A certificate is issued to customer with shipment of each heater. Please verify that you comply with all local codes when selecting heaters.

NOTE #2: Heater is built with no refractory bricks and minimal refractory cement to prevent overheating and cracking of thermal fluid inside the heater in case of power or circulating pump failure.

109,110.00
TOTAL F.O.B. PULASKI, N.Y................~~$174,490.00~~

Add for the following option:

Two (2) each Allweiler pumps, Model NTT 80-200, with air cooled seal designed for 660 Deg. F maximum operating temperature, 660 GPM at 55 PSI, 50 H.P. TEFC 3500 RPM motor, complete with motor starter, 460/60/3 voltage, total price..$ 11,146.00

All prices quoted are F.O.B. Pulaski, New York. Prices are firm for 60 days.

Payment Terms: To be agreed upon. Should this quotation become a firm order, please complete and return the enclosed credit reference form.

Start-up service by a factory technician is extra at $500.00 per day plus travel and accomodation expenses.

The present delivery schedule is approximately 20 to 24 weeks from receipt of order.

SWENSON
15700 Lathrop Avenue • Harvey, Illinois 60426
Telephone 312 • 331-5500 Telex 25-3274

September 12, 1988

TELEFAX NO: 315-437-0509
The Galson Companies
6601 Kirkville Road
Post Office Box 548
East Syracuse, NY 13057

Attn: Mr. Gary Hobbs

Dear Mr. Hobbs:

<u>REFERENCE: KOH CONCENTRATOR</u>

Per your request, this will confirm the information given to your Mr. Jim Morrison on August 31. We have designed a forced-circulation evaporator to concentrate a potassium hydroxide solution from 5% to approximately 15%. Although your process is batch type, we would feed the evaporator on a continuous basis. Therefore, a feed tank with storage capacity would be required. The feed rate is based upon 6,000 gallons of solution every two hours.

The approximate price for an evaporator to concentrate the KOH solution is $225,000.00
(Two Hundred Twenty Five Thousand Dollars)

The above price includes a vapor body of stainless steel construction; heat exchanger with stainless steel tubes, tubesheets and liquor chamber; stainless steel circulating piping and circulating pump; vacuum equipment; and instruments.

The above price does not include an air condenser, interconnecting piping, tanks, transfer pumps, electrical, instrument panel, insulation, structural steel and erection of equipment.

SWENSON

TELEFAX NO: 315-437-0509
The Galson Companies
East Syracuse, NY 13057

September 12, 1988

(Cont'd)

Page -2-

If you have any questions about the above, please contact Mr. Lee Diestelow or the writer. Mr. Diestelow is the salesman for your area.

Thank you for your interest in Swenson equipment.

Sincerely,

S W E N S O N

Peggie Horkavi

Peggie Horkavi
Chemical Engineer
Evaporator Department

MPH/tn

Bird
Machine Company

TELEFAX TRANSMISSION NO. 3786 PAGES: 1

FAX NO. 508-668-6855

DATE: August 26, 1988 FROM: Bill Owens

TO: Galson & Galson ATTN: Jim Morrison

SUBJECT: PCB/Dioxin Decontamintion Project

PCB/Dioxin Decontamination Project:

Jim, we are able to provide the following budget price information for subject project. We understand that you wish to dewater approximately 24 TPH contaminated oil utilizing a continuous solid bowl centrifuge. Three repulp washes are envisioned.

We believe this will be a low speed/high torque application. Without the benefit of test work. We suggest two sizes be considered.

A. One Bird ML5600 (40" x 60") continuous solid bowl centrifuge complete in type 316 SS including internal wear protection for the bowl and scroll, multi ring case seal, circulating oil system for main bearings, high torque gear unit and 100-150 HP TEFC main drive motor.

Budget Price..................................$450,000 each

If additional capacities and or higher gear torque is required, we would recommend the following equipment:

B. One Bird ML7700 (54" x 70") similar to unit previously described including 150-200 HP main drive motor.

Budget Price..........:........................$650,000 each

Delivery - 7-8 months.

Prices are FOB our plant So. Walpole, MA

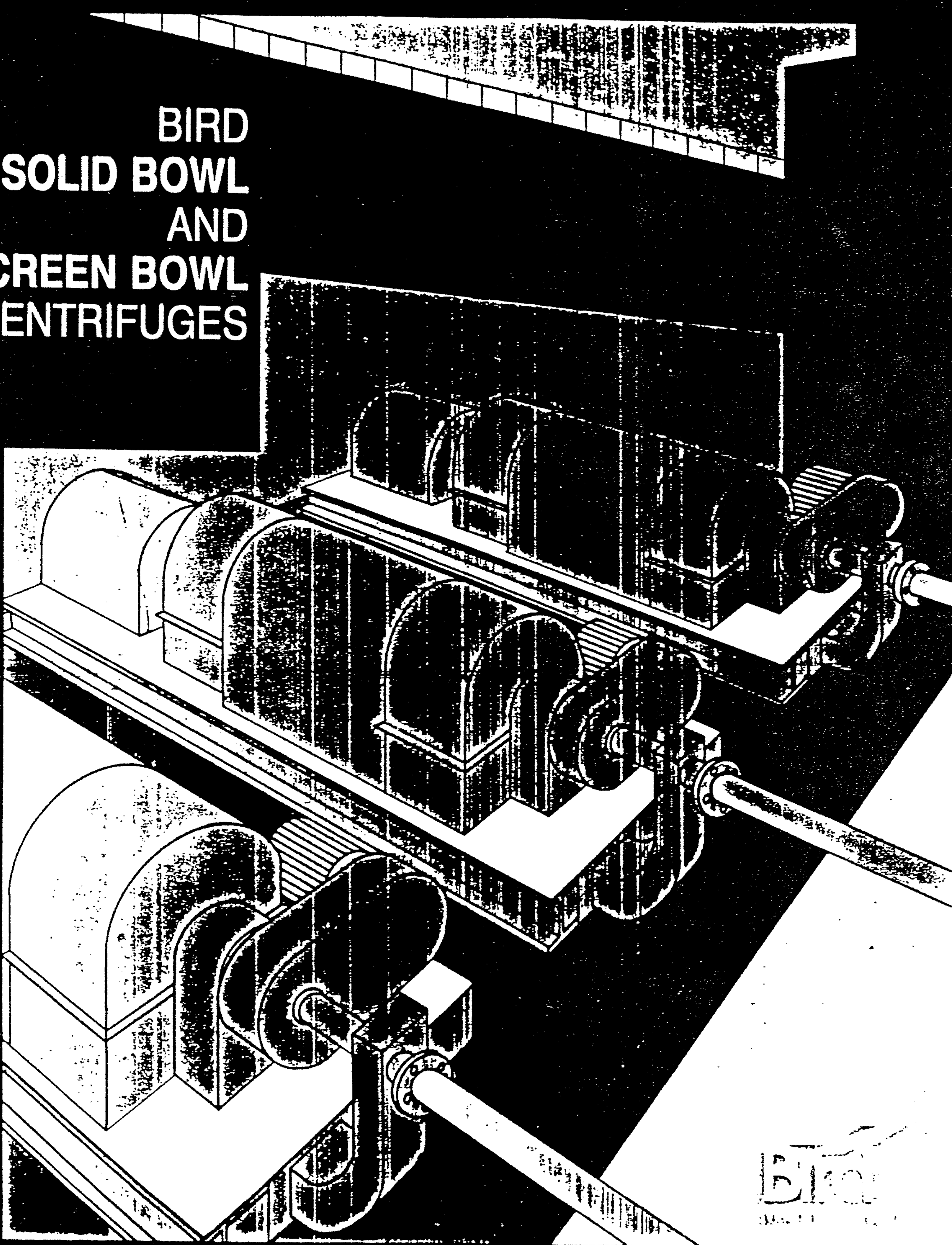
Hope this information is sufficient for your current needs.

Very truly yours,

Bill Owens
/kb

100 Neponset Street, South Walpole, MA 02071 Phone 508-668-0400 Telex 924428

BIRD
SOLID BOWL
AND
SCREEN BOWL
CENTRIFUGES



How a Bird Solid Bowl Centrifuge Operates

The Bird countercurrent flow Solid Bowl Decanter Centrifuge utilizes centrifugal force to separate a slurry into liquid and solid components. This separation takes place thousands of times faster than in a static clarifier.

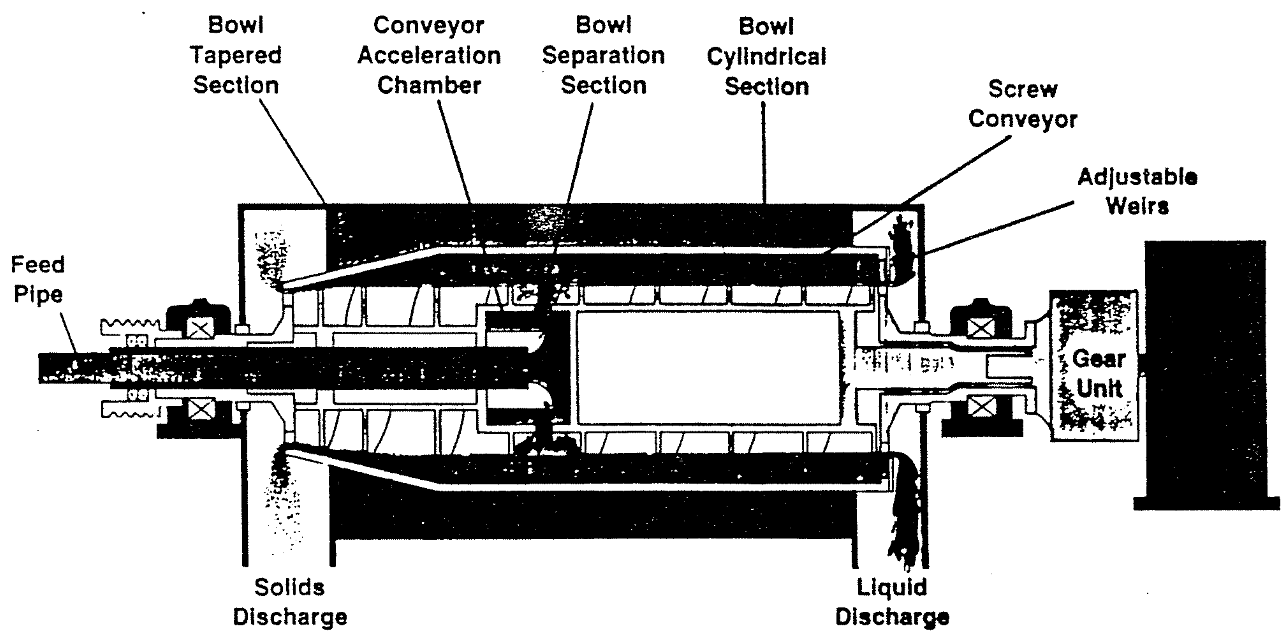
A stationary feed pipe feeds the slurry into the acceleration chamber where the slurry is brought up to the same speed as the rotating assembly. The slurry is discharged out of the acceleration chamber into the separation section of the bowl.

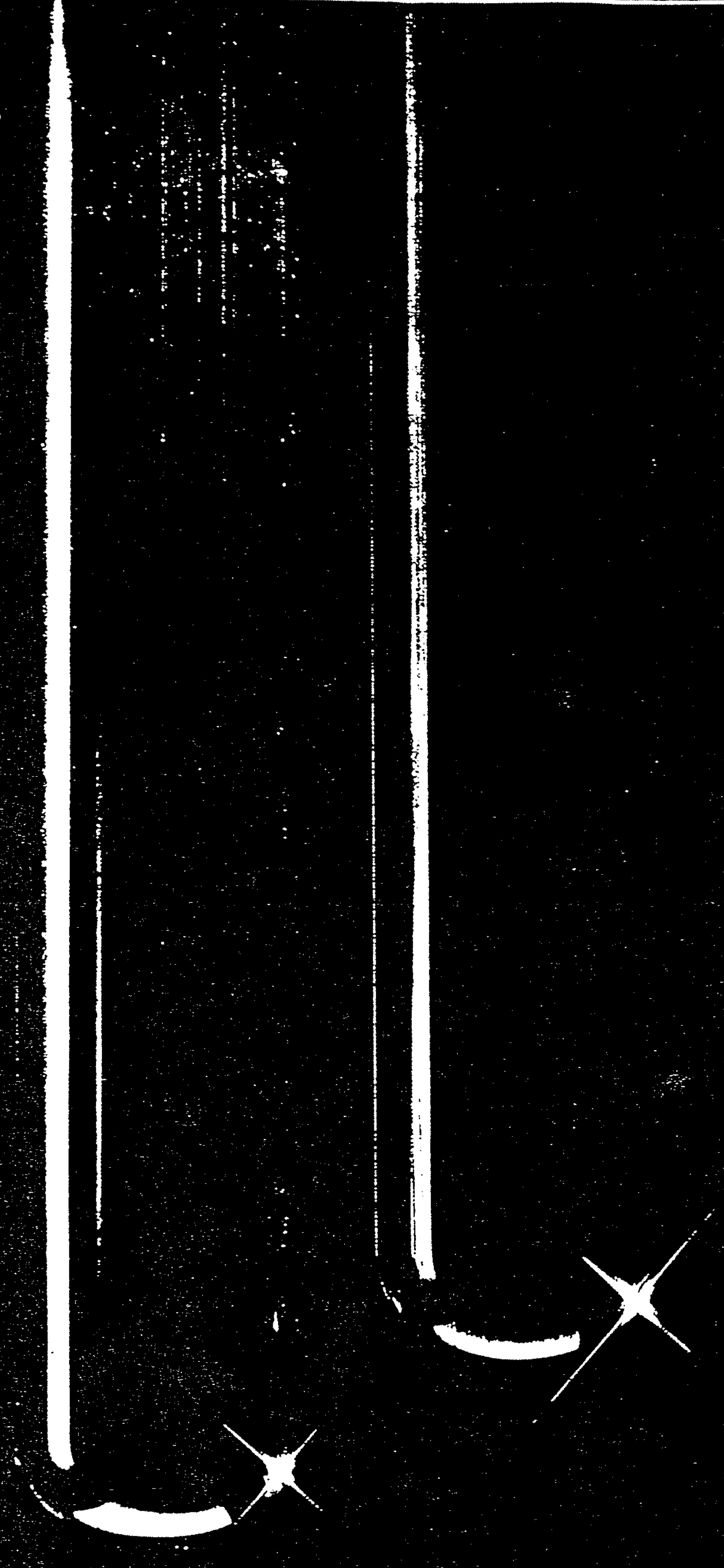
By spinning the bowl at a high speed, thousands of G's are exerted on the solid particles suspended within the slurry. This force pushes the solid particles outward from the centerline of rotation until they collect along the bowl wall. As the solids compact on the bowl they displace the lighter liquid toward the axis of rotation.

The solid bowl is made up of a cylindrical section and a tapered section. The screw conveyor, which is located inside the bowl, turns at a slightly different speed from the bowl. The solids that have compacted along the bowl wall are advanced by the screw conveyor to the tapered end of the bowl where they are discharged from the centrifuge.

The differential speed between the bowl and conveyor is controlled by a planetary gear unit, or an automatic backdrive unit operating with or without the gear unit. This conveyor to bowl differential speed controls the rate of advancement of the solids within the centrifuge. The automatic backdrive senses conditions within the centrifuge and adjusts the differential speed to maintain optimum centrifuge performance.

The clarified process liquid flows in the opposite (countercurrent) direction from the solids and overflows adjustable weirs and is discharged from the centrifuge as a clear centrate.





Separation Equipment for Process Industries

Bird
Machine Company

Bird
Machine Company

To Jim Morrison
Galson and Galson Engrs.
6601 Kirkville Rd.
E. Syracuse, NY 13057

Date August 25, 1988

Our Order No. -----

Your Order No. / Reference -----

Attention: Mr. Jim Morrison

Type of Equipment:
Ref: PCB and Dioxin Decontamination Project

Gentlemen:

We are [X] enclosing
[ ] forwarding under separate cover - the following drawings and/or bulletins for the purpose indicated below.

[ ] Certified - For your records and installation use.

[ ] Preliminary, for Approval - Please note that approval must be received within thirty (30) days if we are to hold to our acknowledged delivery schedule.

[X] Typical - For reference only.

[ ] Others -

Quantity of Prints	Drawing or Bulletin No.	Rev. [1]	Title
(1)	Outline and Foundation Drawing (40x60)		
(1)	Outline and Foundation Drawing (54x70)		
(1)	Application Data Sheet		
(1)	PED100B Bulletin		
(1)	Bird Solid Bowl and Screen Bowl Bulletin		
(1)	Bird Mobile Dewatering and Treatment System Bulletin		

Please forward a five gallon sample of decontaminated material and a purchase order for $350.00 to the attention of Mike Mangion at the address listed below.

Very truly yours,
Bird Machine Company, Inc.

1. Revisions shown in revision table on drawing and identified by number or letter place in △, i.e. (B) or (2)

William J. Owens, Sales Engineer

100 Neponset Street, South Walpole, Massachusetts 02071 Phone 617-668-0400 Telex: 924428

Form C100786G-01M/ESD42-1086

GALSON & GALSON, P.C.
Consulting Engineers
6601 Kirkville Road
EAST SYRACUSE, NEW YORK 13057
(315) 437-7181

PURCHASE ORDER

0002000

THIS NUMBER MUST APPEAR ON ALL CORRESPONDENCE, INVOICES, SHIPPING PAPERS AND PACKAGES.

TO: Bird Machine Co
c/o Barry Bershard
100 Neponset S
S. Walpole, MA 02071

SHIP TO:

DATE ORDERED	DATE WANTED	SHIP VIA	TERMS	F.O.B.
10-14-88		N/A	FIXED	

PLEASE ENTER OUR ORDER FOR THE FOLLOWING — TO BE SHIPPED AS DIRECTED:

QTY. ORDERED	QTY. RECEIVED	DESCRIPTION	UNIT PRICE	AMOUNT
1		Bench Scale Qualification run using Soil from Wide Beach in order to properly size centrifuge equipment RE: GRC/EBASCO Soil DECOM UNIT Job # 88-046	—	$350.00

CONDITIONS
GOODS ARE SUBJECT TO OUR INSPECTION AND APPROVAL.
IF SHIPMENT WILL BE DELAYED FOR ANY REASON, ADVISE US IMMEDIATELY, STATING ALL THE NECESSARY FACTS.
TO AVOID ERRORS, NOTE SPECIFICATIONS CAREFULLY AND IF UNABLE TO COMPLETE ORDERS AS WRITTEN NOTIFY US PROMPTLY.

BY per Jim Morrison
PURCHASING AGENT

PO-700-3

RECEIVED
OCT 17 1988
GALSON COMPANIES

Bird
Machine Company

LABORATORY REPORT NO. 11627A

PREPARED FOR: Galson and Galson
E. Syracuse, NY

PRODUCT: Soil - Reaction Mixture

PRODUCT NO.: 518400

PARTICLE SIZE: MIN. <1m

MAX. 4.5m

AVG. 2.9m

EQUIPMENT PREFERENCE: Decanter

OBJECTIVE: Dewater (see p2)

SUMMARY: The solids settle readily at a low gravitational level. Cake solids are typically about 60%.

Cakes resuspend easily for repulp washing.

Date Tested:	Date Written:	Date Distributed:
9/23/88	9/27/88	

100 Neponset Street, South Walpole, MA 02071 Phone 617-668-0400 Telex 924428

New process to remove PCB from contaminated soil.

Soil is treated with:

polyethylene glycol
potassium hydroxide
TMH
DMSO (dimethyl sulfone)

and heated to 150°C
(200 lbs soil to 120 lbs reagent)

This replaces chlorine in the PCB reducing the contaminant from 100 ppm to less than 10 ppm.

This is a batch process: one reaction step and three repulp washes.

The goal is to recover reactant for reuse.

20-25 tons/batch
up to 150 tons/day
desired process time is 8 hrs/batch

Feed and centrate samples from testing were filtered and washed to remove soluble salts. Filtered samples are suspended solids.

Cake samples are analyzed by drying as collected and represent total solids.

Drying temperature is 105°C.

SAMPLE PREPARATION: Tested as received
Sample 1 - Reaction Mixture

SAMPLE DESCRIPTION AS TESTED:

FEED:	% TS	57.21		
	% SS	31.20		
	% DS	26.01		
	SP. GRAV.:	1.425	(AT 68°F)	
	VISCOSITY:	137 cps	(AT 68°F)	(BROOKFIELD)
LIQUOR:	SP. GRAV.:	1.198	(AT 68°F)	
	VISCOSITY:	7.2 cps	(AT 68°F)	
	pH:	+14	(AT 68°F)	
	COLOR:	Brown		
	COMPOSITION:	Potassium hydroxide solution		
SOLIDS:	COLOR:	Brown		
	SHAPE:	Irregular		

OTHER CHARACTERISTICS: Caustic odor, sulfur odor present.
Viscous and slimy

MAM:jd:27
typed:9/28/88

SPIN TUBE TEST

The ability to centrifuge a sample can be readily determined with a test tube spinner. If a material is applicable to centrifugation, it will spin down in a reasonable time at a given centrifugal force and compact into a bulky cake suitable for conveying. A 15 ml spin tube is used for this test. The tube is filled to the 10 ml mark and spun at a number of gravitational levels. Compaction is measured by placing a glass rod on the surface of the settled solids and measuring the point to which the rod penetrates.

	Sec.	cc Cake	% Vol. Cake	Cake Cond.	% Cake Cond.	Eff. Cond.
500 x G	10	5.3	53	3.3	62.3	*
	30	5.5	55	4.0	72.7	
	60	5.7	57	4.2	73.7	
	90	5.6	56	4.3	76.8	
1000 x G	10	5.5	55	3.5	63.7	*
	30	5.8	58	4.0	69.0	
	60	5.5	55	4.3	78.2	
	90	5.5	55	4.3	78.2	
2000 x G	10	5.5	55	4.0	72.7	*
	30	5.5	55	4.0	72.7	
	60	5.4	54	4.2	77.8	
	90	5.3	53	4.4	83.1	
3000 x G	10	5.5	55	4.0	72.7	*
	30	5.4	54	4.3	79.6	
	60	5.0	50	4.5	90.0	
	90	5.0	50	4.5	90.0	

* Liquor too brown to measure clarity.

SOLID BOWL DECANTER TEST

Solid bowl decanter performance is evaluated by metering a sample into a basket centrifuge at different rates and gravitational levels. The supernate which reports as an overflow stream is analyzed for percent suspended solids. The cake is compacted on the bowl wall and is analyzed for percent total solids. From this data the expected percent solids capture (recovery) and cake consistency for the centrifuge over the operating range can be determined. This data also displays the optimum retention time and gravitational force for an application.

% Feed	31.20	31.20	31.20	31.20
% Cake	68.8	70.5	71.6	70.4
% Effluent	0.624	0.966	2.154	0.601
% Recovery	98.9	98.2	96.0	98.9
Retention Time (Sec.)	74	25	8	78
Force x G	1000	1000	1000	1000

% Feed	31.20	31.20	31.20	31.20	31.20
% Cake	69.9	70.2	70.9	71.7	70.6
% Effluent	3.441	0.803	0.483	1.345	0.803
% Recovery	93.6	98.5	99.1	97.5	98.5
Retention Time (Sec.)	8	30	66	8	25
Force x G	500	500	2000	2000	2000

PERFORATE BOWL SOLIDS DEWATERING TEST

The Perforate Bowl is used to measure the maximum cake dryness which is possible with a given product. A thickened sample of feed is prepared to simulate the settled solids in a decanter centrifuge. This thickened material is spun in a perforated basket with an open cloth liner to measure the consistency of the cake with increasing dewatering times and at various gravitational levels.

	*	*	*	
% Feed	31.2	31.2	31.2	31.2
% Cake	51.2	55.7	59.9	64.9
% Effluent	0.63	0.63	0.63	0.63
% Recovery	99.2	99.1	99.0	98.9
Dewatering Time (Sec.)	5	15	30	60
Force x G	500	500	500	500

* Liquid load.

% Feed	51.3	51.3	51.3	51.3
% Cake	70.3	70.9	71.1	71.4
% Effluent	0.63	0.63	0.63	0.63
% Recovery	99.7	99.7	99.7	99.7
Dewatering Time (Sec.)	5	15	30	60
Force x G	500	500	500	500

The wet cake (70%ts) is 99#/Ft^3.

Bird Machine Company

LABORATORY REPORT NO. 11627B

PREPARED FOR: Galson and Galson
E. Syracuse, NY

PRODUCT: Soil - First Repulp Wash

PRODUCT NO.: 518400

PARTICLE SIZE: MIN. <1m

MAX. 290m

AVG. 4.2m

EQUIPMENT PREFERENCE: Decanter

OBJECTIVE: Dewater

SUMMARY:

Date Tested: 9/23/88

Date Written: 9/27/88

Date Distributed:

SAMPLE PREPARATION: Repulped cake from test A

SAMPLE DESCRIPTION AS TESTED:

FEED:	% TS	29.49	
	% SS	20.87	
	% DS	8.62	
	SP. GRAV.:	1.22	(AT 68°F)
	VISCOSITY:	4 cps	(AT 68°F) (BROOKFIELD)
LIQUOR:	SP. GRAV.:	1.013	(AT 68°F)
	VISCOSITY:	2.2 cps	(AT 68°F)
	pH:	13	(AT 68°F)
	COLOR:	Brown	
	COMPOSITION:	Potassium hydroxide solution	
SOLIDS:	COLOR:	Brown	
	SHAPE:	Irregular	

OTHER CHARACTERISTICS: Agglomerates noted in feed.
Easily resuspended cake for repulp.

SPIN TUBE TEST

The ability to centrifuge a sample can be readily determined with a test tube spinner. If a material is applicable to centrifugation, it will spin down in a reasonable time at a given centrifugal force and compact into a bulky cake suitable for conveying. A 15 ml spin tube is used for this test. The tube is filled to the 10 ml mark and spun at a number of gravitational levels. Compaction is measured by placing a glass rod on the surface of the settled solids and measuring the point to which the rod penetrates.

	Sec.	cc Cake	% Vol. Cake	Cake Cond.	% Cake Cond.	Eff. Cond.
500 x G	10	3.2	32	2.3	71.9	*
	30	3.3	33	2.5	75.7	
	60	3.15	31.5	2.7	85.7	
	90	3.1	31	2.7	87.1	
1000 x G	10	3.0	30	2.5	83.3	*
	30	2.9	29	2.5	86.2	
	60	2.9	29	2.5	86.2	
	90	2.9	29	2.5	86.2	
2000 x G	10	3.0	30	2.5	83.3	*
	30	2.9	29	2.5	86.2	
	60	2.9	29	2.5	86.2	
	90	2.9	29	2.5	86.2	
3000 x G	10	2.9	29	2.5	86.2	*
	30	2.9	29	2.5	86.2	
	60	2.85	28.5	2.5	87.7	
	90	2.8	28	2.5	89.3	

* Liquor too brown to measure clarity.

SOLID BOWL DECANTER TEST

Solid bowl decanter performance is evaluated by metering a sample into a basket centrifuge at different rates and gravitational levels. The supernate which reports as an overflow stream is analyzed for percent suspended solids. The cake is compacted on the bowl wall and is analyzed for percent total solids. From this data the expected percent solids capture (recovery) and cake consistency for the centrifuge over the operating range can be determined. This data also displays the optimum retention time and gravitational force for an application.

% Feed	29.49	29.49	29.49
% Cake	59.96	65.35	63.31
% Effluent	0.527	1.108	2.028
% Recovery	98.3	96.3	93.2
Retention Time (Sec.)	42	15	11
Force x G	500	500	500

% Feed	29.49	29.49	29.49
% Cake	63.68	65.51	60.86
% Effluent	0.374	0.946	1.958
% Recovery	98.8	96.9	93.6
Retention Time (Sec.)	47	14	11
Force x G	1000	1000	1000

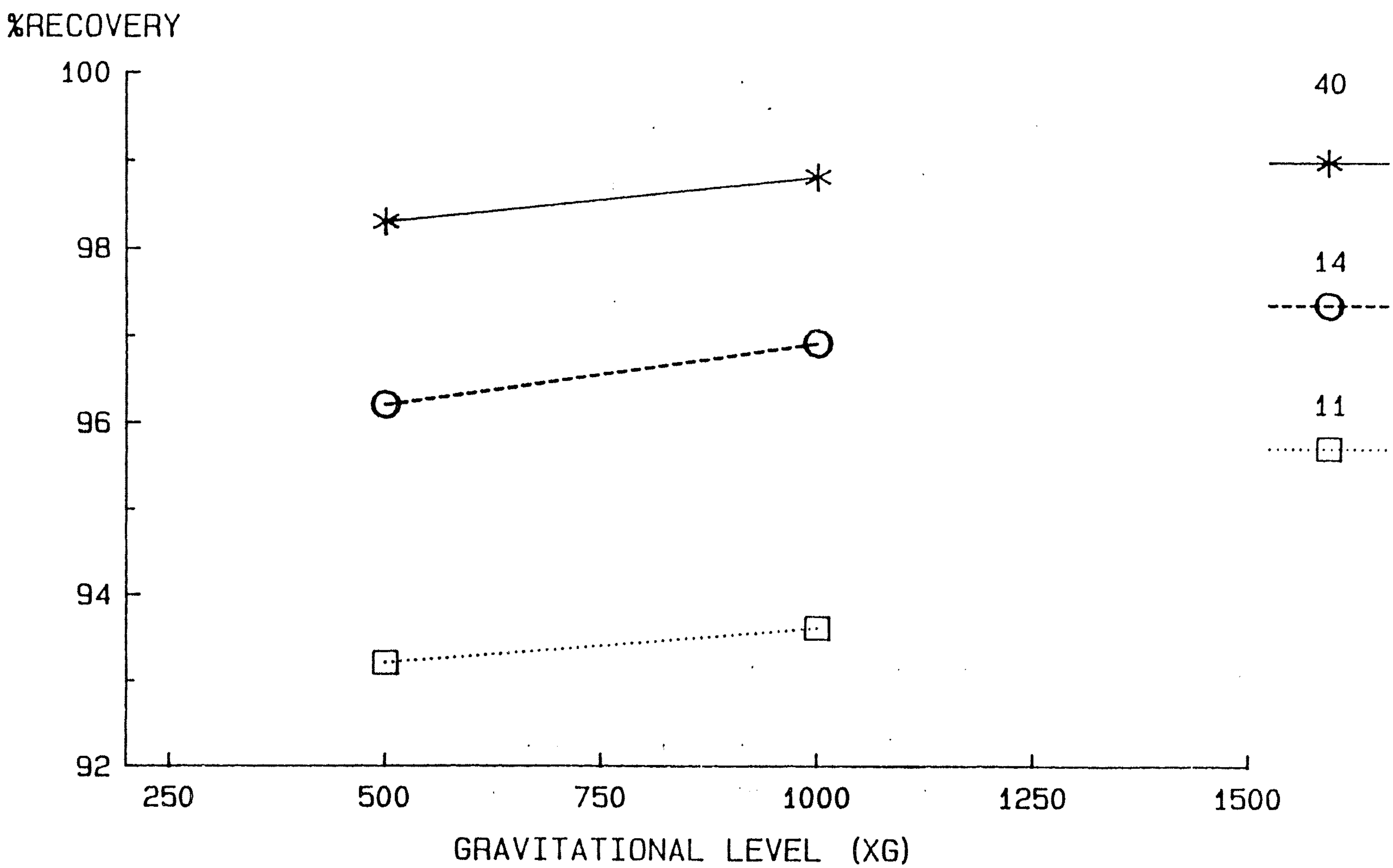
PERFORATE BOWL SOLIDS DEWATERING TEST

The Perforate Bowl is used to measure the maximum cake dryness which is possible with a given product. A thickened sample of feed is prepared to simulate the settled solids in a decanter centrifuge. This thickened material is spun in a perforated basket with an open cloth liner to measure the consistency of the cake with increasing dewatering times and at various gravitational levels.

% Feed	56.4	56.4	56.4	56.4
% Cake	66.52	67.36	68.40	69.57
% Effluent	0.331	0.331	0.331	0.331
% Recovery	99.9	99.9	99.9	99.9
Dewatering Time (Sec.)	5	15	30	60
Force x G	500	500	500	500

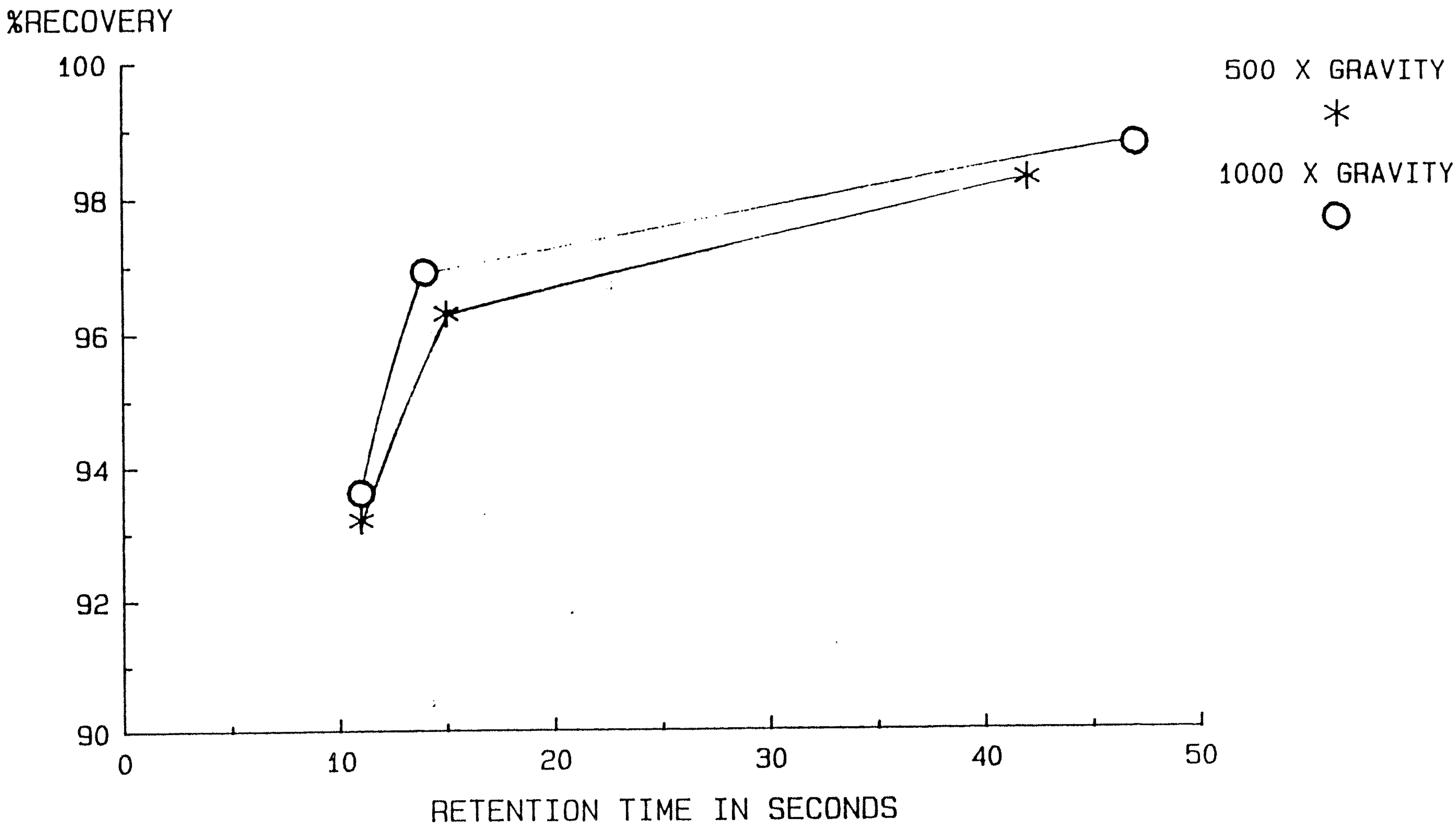
The wet cake is 97#/ft^3.

SOLID BOWL DECANTER TEST
%RECOVERY VS GRAVITATIONAL LEVEL



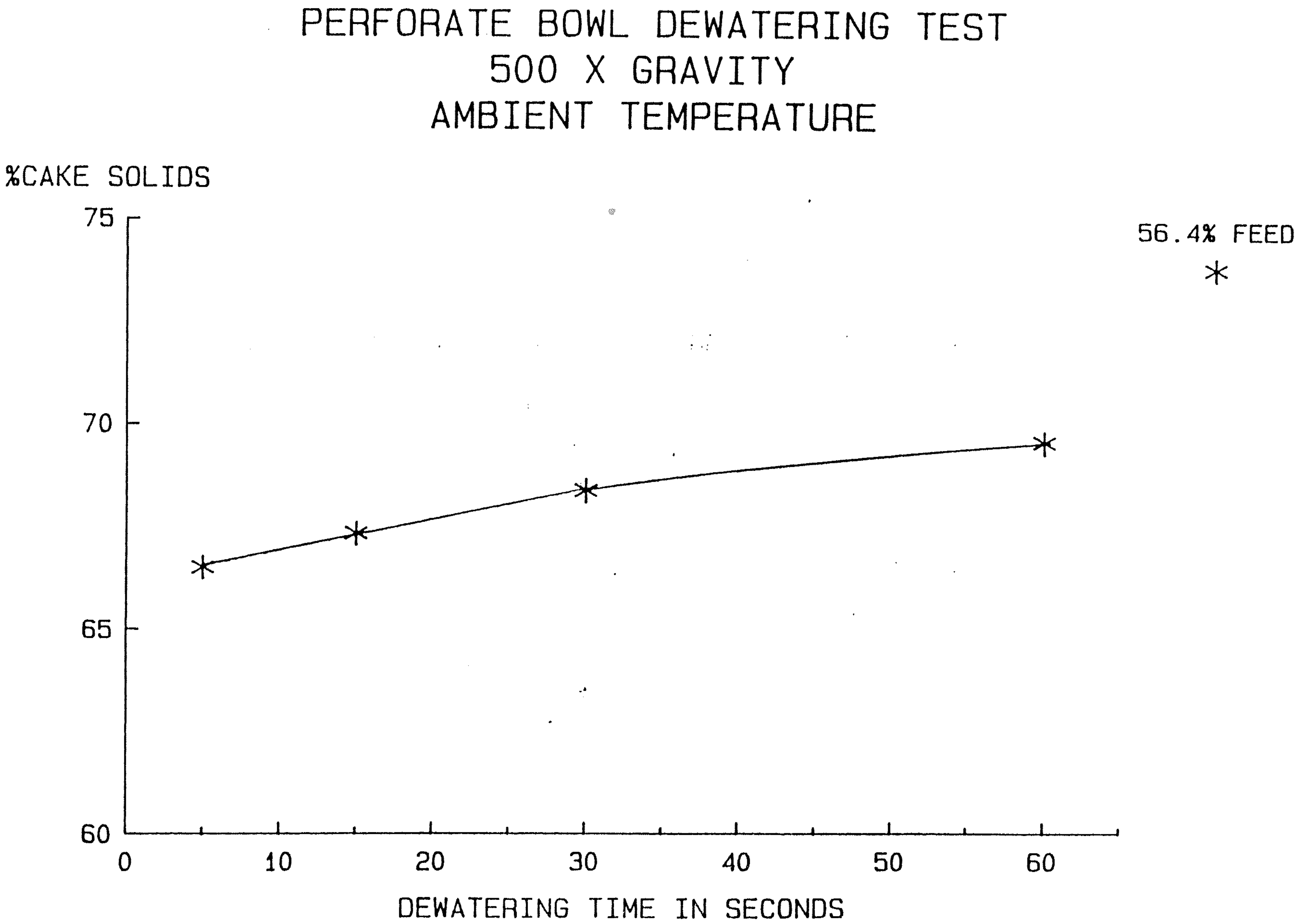
AMBIENT TEMPERATURE

SOLID BOWL CENTRIFUGE TEST



AMBIENT TEMPERATURE

1161 B
p8



PERFORATE BOWL DEWATERING TEST
500 X GRAVITY
AMBIENT TEMPERATURE
%CAKE SOLIDS
75
70
65
60
0
10
20
30
40
50
60
DEWATERING TIME IN SECONDS
56.4% FEED

SAMPLE 2
SAMP. TIME = 60 SEC
AVERAGE OF 3 RUNS
GAIN ADJUST

DV = 0.0136
%13 = 2.11
%50 = 4.29
%90 = 93.86
MV = 37.80
CS = 1.744

PERCENT PASSING

CHAN.	CUM.	VOL.
300	100.0	10.1
212	89.9	3.2
150	86.7	3.4
106	83.4	0.0
75	83.4	0.0
53	83.4	0.0
38	83.4	0.0
27	83.4	0.0
19	83.4	0.0
13	83.4	0.0
9.4	83.4	2.2
6.6	81.2	7.5
4.7	73.6	27.1
3.3	46.5	24.3
2.4	22.2	22.2

RELATIVE VOL. GRAPH

```
250  ***10
176  *3
125  *3
 88  0
 62  0
 44  0
 31  0
 22  0
 16  0
 11  0
7.8  2
5.5  **7
3.9  ***********27
2.8  *********24
1.9  *********22
```

CUMMULATIVE GRAPH

```
300  **********100
212  ********89
150  ********86
106  ********83
 75  ********83
 53  ********83
 38  ********83
 27  ********83
 19  ********83
 13  ********83
9.4  ********83
6.6  ********81
4.7  *******73
3.3  ****46
2.4  **22
```

Bird
Machine Company

LABORATORY REPORT NO. 11627C

PREPARED FOR: Galson and Galson
E. Syracuse, NY

PRODUCT: Soil - Repulp #2

PRODUCT NO.: 518400

PARTICLE SIZE: MIN. <1m

MAX. 9m

AVG. 5m

EQUIPMENT PREFERENCE: Decanter

Date Tested:	Date Written:	Date Distributed:
9/23/88	9/27/88	

100 Neponset Street, South Walpole, MA 02071 Phone 617-668-0400 Telex 924428

SAMPLE PREPARATION: Repulped cake from test B

SAMPLE DESCRIPTION AS TESTED:

FEED:	% TS 28.77			
	% SS 26.38			
	% DS 2.39			
	SP. GRAV.:	1.186	(AT 68°F)	
	VISCOSITY:	4.82 cps	(AT 68°F)	(BROOKFIELD)
LIQUOR:	SP. GRAV.:	1.011	(AT 68°F)	
	VISCOSITY:	2 cps	(AT 68°F)	
	pH: 12		(AT 68°F)	
	COLOR: Brown			
	COMPOSITION: Potassium hydroxide solution			
SOLIDS:	COLOR: Brown			
	SHAPE: Irregular			

OTHER CHARACTERISTICS: Easily resuspended solids.

MAM:jd:27
typed:9/28/88

SPIN TUBE TEST

The ability to centrifuge a sample can be readily determined with a test tube spinner. If a material is applicable to centrifugation, it will spin down in a reasonable time at a given centrifugal force and compact into a bulky cake suitable for conveying. A 15 ml spin tube is used for this test. The tube is filled to the 10 ml mark and spun at a number of gravitational levels. Compaction is measured by placing a glass rod on the surface of the settled solids and measuring the point to which the rod penetrates.

	Sec.	cc Cake	% Vol. Cake	Cake Cond.	% Cake Cond.	Eff. Cond.
500 x G	10	4.4	4	3.0	68.2	Cloudy
	30	4.5	45	3.5	77.8	Sl. cloudy
	60	4.3	43	3.8	88.4	Ess. clear
	90	4.3	43	3.8	88.4	" "
1000 x G	10	4.3	43	3.7	86.0	Sl. cloudy
	30	4.3	43	3.7	86.0	Ess. clear
	60	4.2	42	3.8	90.5	" "
	90	4.2	42	3.9	90.5	" "

SOLID BOWL DECANTER TEST

Solid bowl decanter performance is evaluated by metering a sample into a basket centrifuge at different rates and gravitational levels. The supernate which reports as an overflow stream is analyzed for percent suspended solids. The cake is compacted on the bowl wall and is analyzed for percent total solids. From this data the expected percent solids capture (recovery) and cake consistency for the centrifuge over the operating range can be determined. This data also displays the optimum retention time and gravitational force for an application.

% Feed	26.38	26.38	26.38
% Cake	59.5	69.6	61.9
% Effluent	0.512	1.059	2.358
% Recovery	98.9	97.5	94.7
Retention Time (Sec.)	36	14	3
Force x G	500	500	500

% Feed	26.38	26.38	26.38
% Cake	54.1	60.2	63.3
% Effluent	0.404	0.698	1.530
% Recovery	99.2	98.5	96.5
Retention Time (Sec.)	42	11	3
Force x G	1000	1000	1000

PERFORATE BOWL SOLIDS DEWATERING TEST

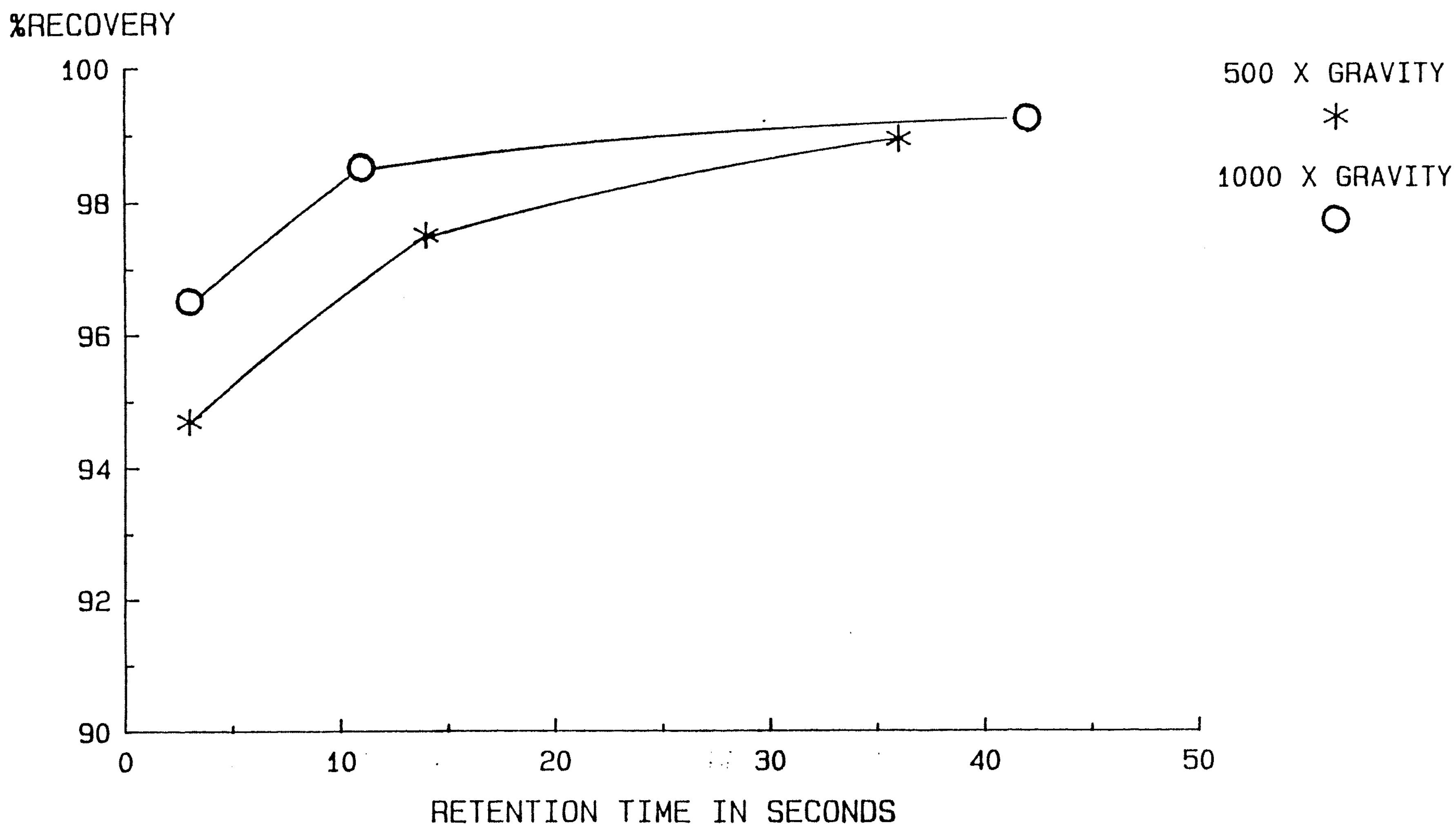
The Perforate Bowl is used to measure the maximum cake dryness which is possible with a given product. A thickened sample of feed is prepared to simulate the settled solids in a decanter centrifuge. This thickened material is spun in a perforated basket with an open cloth liner to measure the consistency of the cake with increasing dewatering times and at various gravitational levels.

% Feed	56.5	56.5	56.5	56.5
% Cake	61.3	61.7	62.1	62.8
% Effluent	0.338	0.338	0.338	0.338
% Recovery	99.9	99.9	99.9	99.9
Dewatering Time (Sec.)	5	15	30	60
Force x G	500	500	500	500

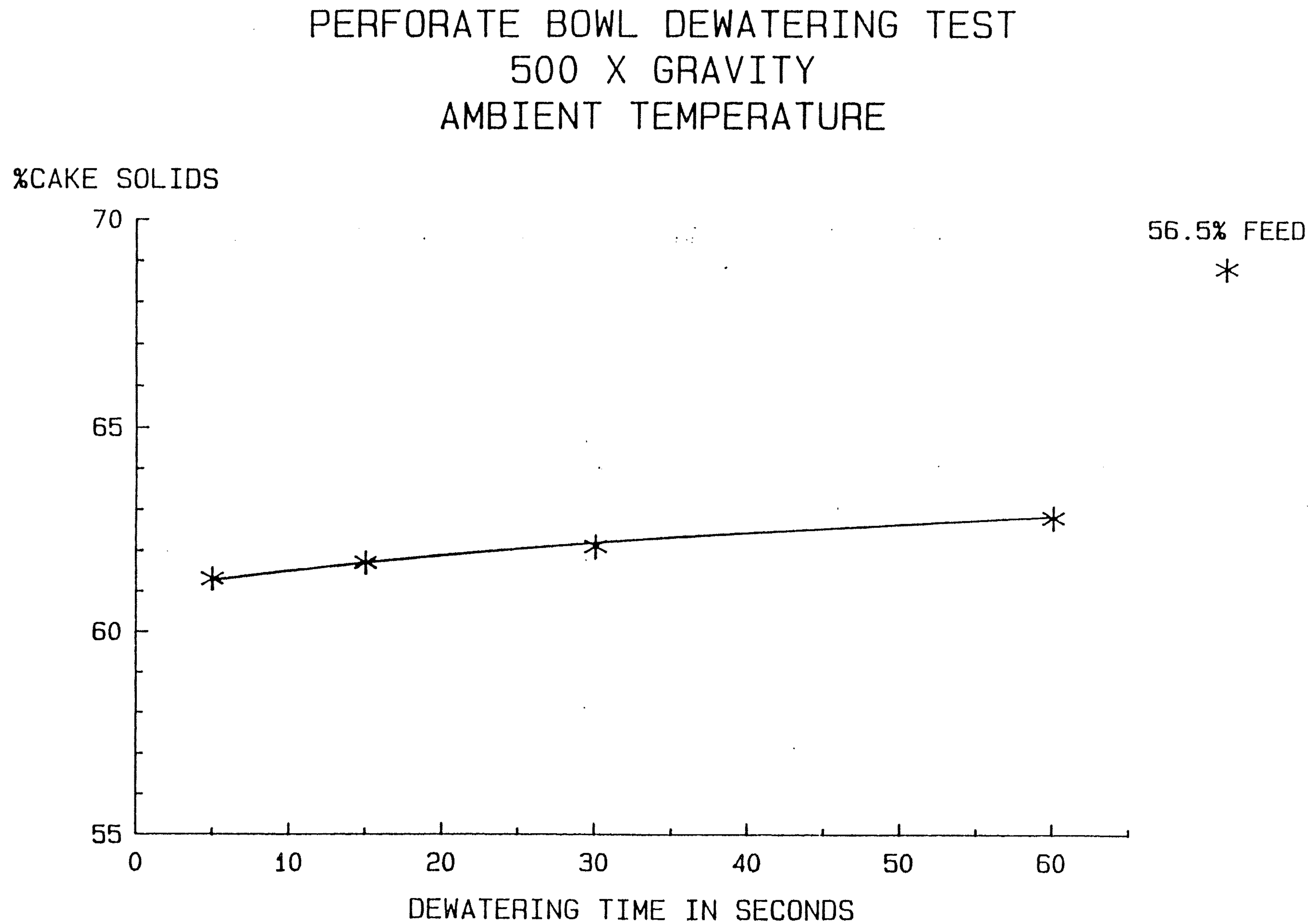
The wet cake is 89 #/ft^3.

11627 C
p6

SOLID BOWL CENTRIFUGE TEST

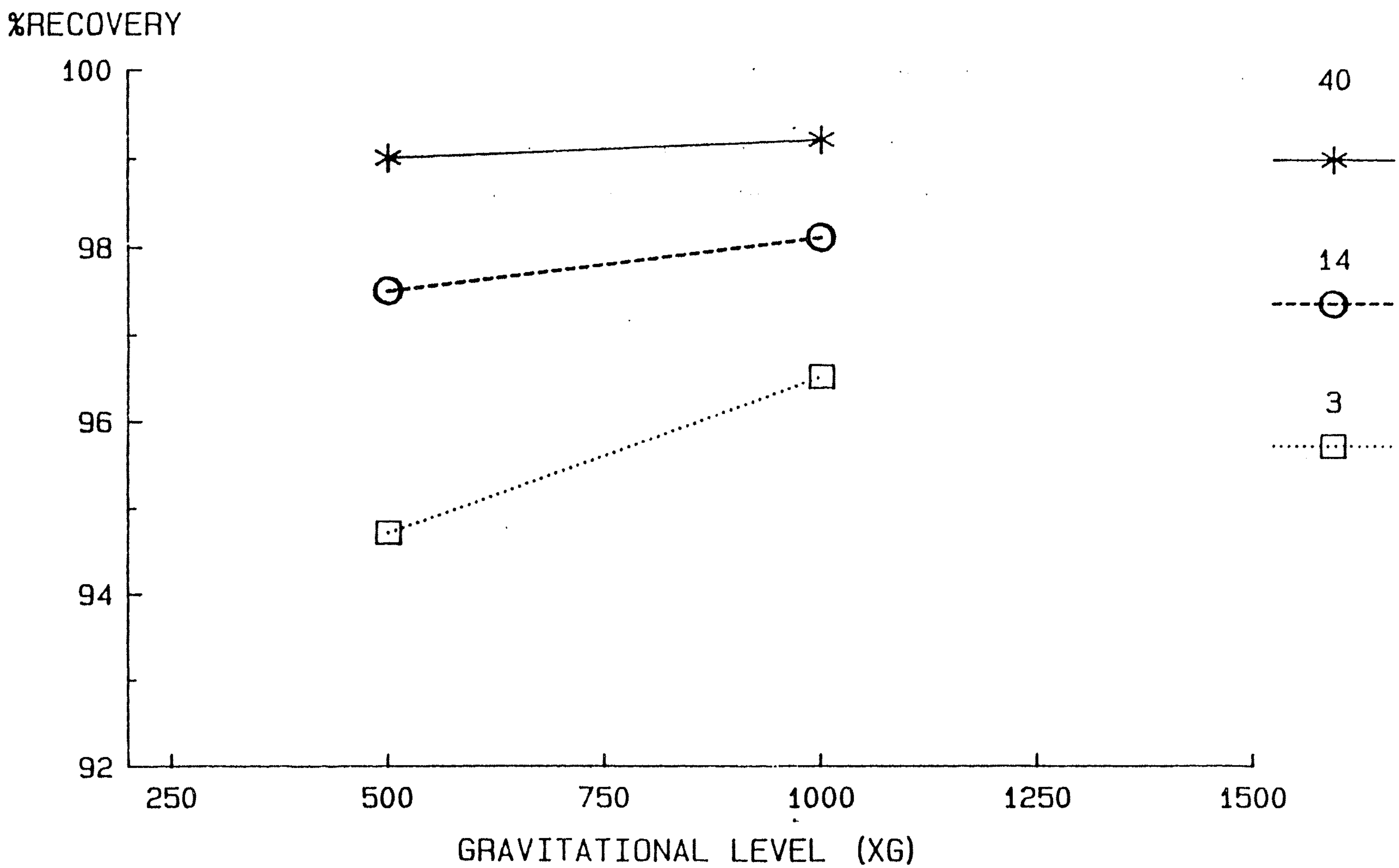


AMBIENT TEMPERATURE


PERFORATE BOWL DEWATERING TEST
500 X GRAVITY
AMBIENT TEMPERATURE
%CAKE SOLIDS
70
65
60
55
0
10
20
30
40
50
60
DEWATERING TIME IN SECONDS
56.5% FEED

11627 C
p8

SOLID BOWL DECANTER TEST
%RECOVERY VS GRAVITATIONAL LEVEL



AMBIENT TEMPERATURE

FEED 3
SAMP. TIME = 60 SEC
AVERAGE OF 3 RUNS
GAIN ADJUST

DV = 0.0068
%13 = 3.02
%50 = 5.00
%90 = 6.38
MV = 4.69
CS = 1.412

PERCENT PASSING

CHAN.	CUM.	VOL.
=====	====	====
300	100.0	0.0
212	100.0	0.0
150	100.0	0.0
106	100.0	0.0
75	100.0	0.0
53	100.0	0.0
38	100.0	0.0
27	100.0	0.0
19	100.0	0.0
13	100.0	0.0
9.4	100.0	3.6
6.6	96.4	55.1
4.7	41.3	24.2
3.3	17.1	12.7
2.4	4.4	4.4

RELATIVE VOL. GRAPH

```
250  0
176  0
125  0
 88  0
 62  0
 44  0
 31  0
 22  0
 16  0
 11  0
7.8  3
5.5  ***********55
3.9  ****24
2.8  **12
1.9  4
```

CUMMULATIVE GRAPH

```
300  **********100
212  **********100
150  **********100
106  **********100
 75  **********100
 53  **********100
 38  **********100
 27  **********100
 19  **********100
 13  **********100
9.4  **********100
6.6  *********96
4.7  ****41
3.3  *17
2.4  4
```

Bird
Machine Company

LABORATORY REPORT NO. 11627D

PREPARED FOR: Galson and Galson

PRODUCT: Soil - Repulp #3

PRODUCT NO.: 518400

PARTICLE SIZE: MIN. <1 m

MAX. 8 m

AVG. 5.2 m

EQUIPMENT PREFERENCE: Decanter

OBJECTIVE:

SUMMARY:

Date Tested:	Date Written:	Date Distributed:
9/23/88	9/27/88	9/29/88

SAMPLE PREPARATION: Repulped cake from Test C

SAMPLE DESCRIPTION AS TESTED:

FEED:	% TS 28.86			
	% SS 27.88			
	% DS 0.98			
	SP. GRAV.:	1.212	(AT 68°F)	
	VISCOSITY:	2.8 cps	(AT 68°F)	(BROOKFIELD)
LIQUOR:	SP. GRAV.:	1.00	(AT 68°F)	
	VISCOSITY:	2 cps	(AT 68°F)	
	pH:	11	(AT 68°F)	
	COLOR:	Brown		
	COMPOSITION:	Potassium hydroxide solution		
SOLIDS:	COLOR:	Brown		
	SHAPE:	Irregular		

OTHER CHARACTERISTICS: Easily resuspended solids

SPIN TUBE TEST

The ability to centrifuge a sample can be readily determined with a test tube spinner. If a material is applicable to centrifugation, it will spin down in a reasonable time at a given centrifugal force and compact into a bulky cake suitable for conveying. A 15 ml spin tube is used for this test. The tube is filled to the 10 ml mark and spun at a number of gravitational levels. Compaction is measured by placing a glass rod on the surface of the settled solids and measuring the point to which the rod penetrates.

	Sec.	cc Cake	% Vol. Cake	Cake Cond.	% Cake Cond.	Eff. Cond.
500 x G	10	4.7	47	3.3	70.2	Ess. clr.
	30	4.7	47	4.0	85.1	"
	60	4.6	46	4.3	93.5	"
	90	4.6	46	4.3	93.5	"
1000 x G	10	4.8	48	4.3	89.6	Ess. clr.
	30	4.7	47	4.3	91.5	"
	60	4.6	46	4.3	93.5	"
	90	4.6	46	4.4	95.6	"

SOLID BOWL DECANTER TEST

Solid bowl decanter performance is evaluated by metering a sample into a basket centrifuge at different rates and gravitational levels. The supernate which reports as an overflow stream is analyzed for percent suspended solids. The cake is compacted on the bowl wall and is analyzed for percent total solids. From this data the expected percent solids capture (recovery) and cake consistency for the centrifuge over the operating range can be determined. This data also displays the optimum retention time and gravitational force for an application.

% Feed	28.86	28.86	28.86	28.86
% Cake	60.7	63.6	63.4	61.6
% Effluent	0.138	0.403	1.210	0.316
% Recovery	99.7	99.2	97.7	99.4
Retention Time (Sec.)	45	26	3	45
Force x G	1000	1000	1000	1000

% Feed	28.86	28.86	28.86	28.86	28.86
% Cake	61.9	62.7	62.2	62.8	64.9
% Effluent	0.422	1.313	0.501	1.020	1.993
Retention Time (Sec.)	26	8	45	16	13
Force x G	500	500	250	250	250

PERFORATE BOWL SOLIDS DEWATERING TEST

The Perforate Bowl is used to measure the maximum cake dryness which is possible with a given product. A thickened sample of feed is prepared to simulate the settled solids in a decanter centrifuge. This thickened material is spun in a perforated basket with an open cloth liner to measure the consistency of the cake with increasing dewatering times and at various gravitational levels.

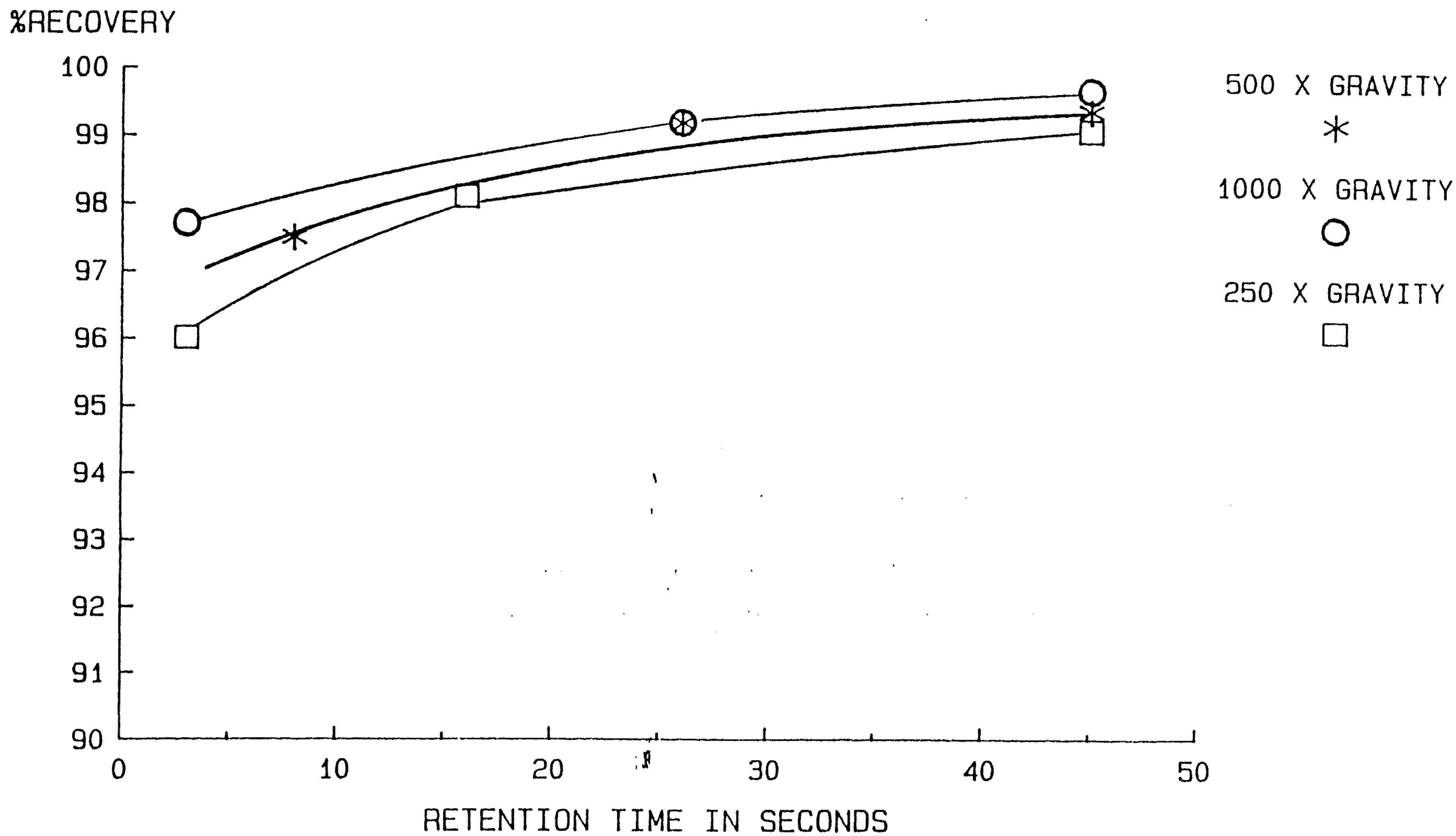
% Feed	56.9	56.9	56.9	56.9
% Cake	62.1	62.8	63.2	63.9
% Effluent	0.388	0.388	0.388	0.388
% Recovery	99.2	99.9	99.9	99.9
Dewatering Time (Sec.)	5	15	30	60
Force x G	500	500	500	500

The wet cake is 95 #/Ft.^{3}

MAMangion/cmd/27
9/29/88

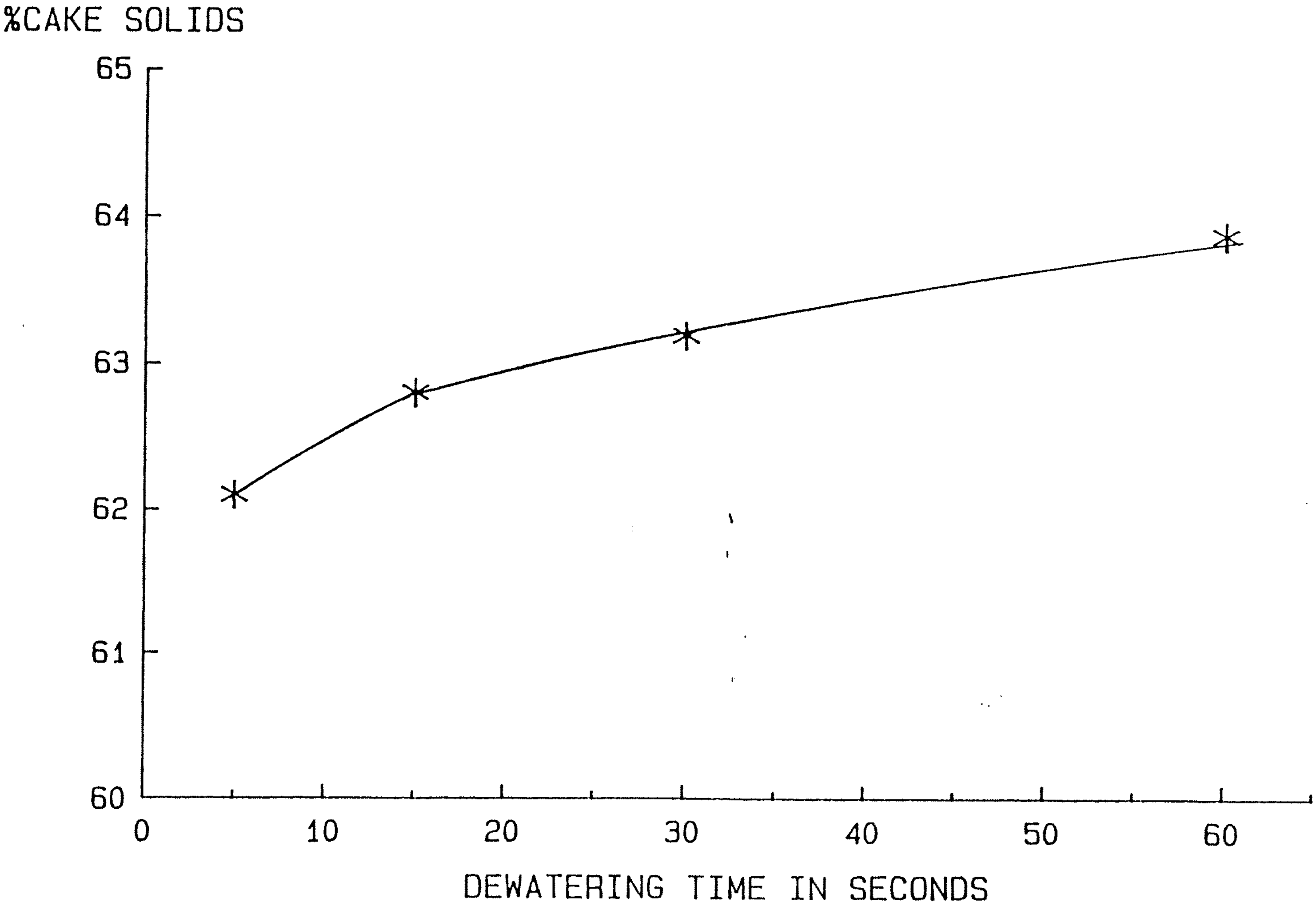
11627 D
p6

SOLID BOWL DECANTER TEST



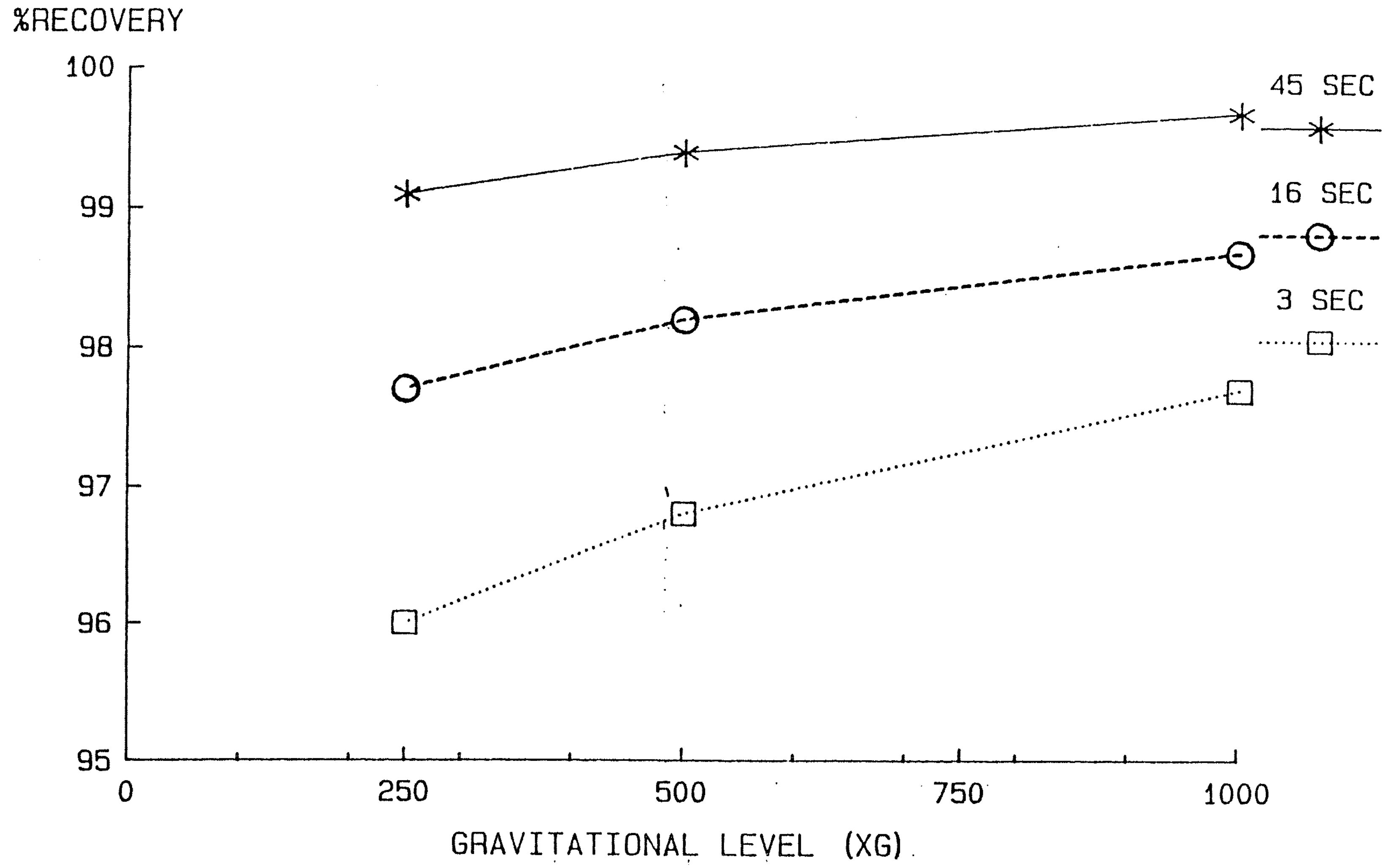
AMBIENT TEMPERATURE

PERFORATE BOWL DEWATERING TEST
500 X GRAVITY
AMBIENT TEMPERATURE



11627 D
p8

SOLID BOWL DECANTER TEST
%RECOVERY VS GRAVITATIONAL LEVEL



AMBIENT TEMPERATURE

FEED 4
SAMP. TIME = 60 SEC
AVERAGE OF 3 RUNS
GAIN ADJUST

DV	=	0.0094
%13	=	3.24
%50	=	5.23
%90	=	7.01
MV	=	5.03
CS	=	1.326

PERCENT PASSING

CHAN.	CUM.	VOL.
300	100.0	0.0
212	100.0	0.0
150	100.0	0.0
106	100.0	0.0
75	100.0	0.0
53	100.0	0.0
38	100.0	0.0
27	100.0	0.0
19	100.0	0.0
13	100.0	0.0
9.4	100.0	11.7
6.6	88.3	53.0
4.7	35.3	21.5
3.3	13.7	10.6
2.4	3.1	3.1

RELATIVE VOL. GRAPH

250	0
176	0
125	0
88	0
62	0
44	0
31	0
22	0
16	0
11	0
7.8	**11
5.5	***********52
3.9	****21
2.8	*10
1.9	3

CUMMULATIVE GRAPH

300	**********100
212	**********100
150	**********100
106	**********100
75	**********100
53	**********100
38	**********100
27	**********100
19	**********100
13	**********100
9.4	**********100
6.6	********88
4.7	***35
3.3	*13
2.4	3

E. M. CAHILL, Sales Representative

Buffalo

Buffalo Forge Company
An Ampco-Pittsburgh Company

104 CHARLES AVENUE
SOLVAY, NEW YORK 13209
Telephone: 315-488-0351
Fax: 315-488-0352

FAX COMMUNICATIONS COVER LETTER

Aug 25, 1988

TO: Galson & Galson

Gary Hobbs

WE ARE TELECOMMUNICATING 5 PAGE(S) OF INFORMATION INCLUDING THIS COVER PAGE.

FROM: E. M. CAHILL
SYRACUSE, NY

FAX #315-488-0352

SUBJECT: Steam Condenser

LOCATION:

ENGINEER:

REFERENCE:

MESSAGE: Attached are our dimension/data sheets for three steam condenser units. The estimated price is $39,000 net each.

MARK: ______
S.O.#: ______

Buffalo Forge Company
CABINET ORDER DATA SHEET

☐ SOUND TRAP - MODULAR (MOD)
☐ SOUND TRAP - CONE DIFFUSER (CD)
MFG ______ CONSTRUCTION ______

TYPE-SIZE	L'	ΔP"	Db.	1	2	3	4	5	6	7	8

☐ AEROFIL ☐ RECIR ☐ NONRECIRC MEDIA DEPTH ______ TYPE ______ SAT. EFF. ______
FACE AREA ______ FT² FACE VELOCITY ______ GPM ______ HEAD ______
PUMP BY ______ ☐ INTERNALLY MOUNTED ______ ☐ MOUNT BY OTHERS SIZE ______
HP ______ RPM ______ PH/CYCLE/VOLT ______ MTR ENCL. ______
OTHER FEATURES ______

☐ EXPANDED METAL GRATING - LOCATION ______

☐ DIFFUSER PLATE - LOCATION ______

☐ ELECTRICAL REQUIREMENTS ______

☐ PIPING REQUIREMENTS ______

☐ TESTING AND Q/C OR INSPECTION REQUIREMENTS ______

☐ ADDITIONAL CABINET CONSTRUCTION REQUIREMENTS ______

☐ OTHER PURCHASED MATERIAL DETAILS ______

FORM 5091

MARK: ____
S.O.#: ____

Buffalo Forge Company
CABINET ORDER DATA SHEET

AC-2001
Page 3 of 4
10-1-87

FAN DATA	SUPPLY FAN	RETURN FAN
QTY.	1	
SIZE/DIA.	48 / 87	/
TYPE	S- ADJUSTAX	
CLASS		
ARR	9	

FAN RATING	PRESENT	FUTURE	PRESENT	FUTURE
ACFM	44500			
INT. SP				
EXT. SP				
TOT. PRESS.	4.0			
RPM	1800			
BHP	39			
OV	3500			

FAN CONSTRUCTION		
VIV	☐	☐
ACCESS DOOR	☐ @ ____ o'clock	☐ @ ____ o'clock
DRAIN	☐	☐
INL. SCREEN	☐	☐
OUT. SCREEN	☐	☐
SPLIT BRG	☐	☐
LUBE LINES	☐	☐
OUT. DAMPER	☐	☐
LEGS	☒	☐
BELL	☐	☐
CONE	☐	☐
INTERNAL ISOL.	☐	☐
STD SPR BASE	☒ 1" DEFLECTION	☐ ____" DEFLECTION
INERTIA BASE	☐ ____" DEFLECTION	☐ ____" DEFLECTION
SEISMIC REST	☐	☐
FIXED DRIVE	☒ ____ S.F. of MHP	☐ ____ S.F. of MHP
VARIABLE DRIVE	☐ ____ S.F. of MHP	☐ ____ S.F. of MHP
BELT GUARD	☒	☐
TACH HOLES	☐	☐
ADDITIONAL FAN DETAILS		

MOTOR DATA	PRES. STD. HI	PRES. STD. HI
HP	40	
RPM	1750	
ENCLOSURE	TEFC	
FRAME		
MFG		
PH/Hz/VOLT	3-60-230/460	
MTR FEATURES		

☐ ELECTRIC COIL MFG ____ KW ____
☐ OPEN WIRE ☐ FINNED TUBE STAGES ____
EAT ____ LAT ____ SUPPLY VOLT ____
CONTROL TYPE ____
CONTROL VOLT ____ ACCESSORIES ____

COOLING BANK	#1	#2
QTY/MFG	/	/
SERIES		
TYPE		
CIRCUIT		
CSG HGT		
NTL		
FA	48	
FV	930	
DB./WB. - ENT.	/	/
DB./WB. - LVG.	/	/
BTU/HR		
GPM		
EWT		
LWT		
HEAD LOSS - FT.		
AIR FRICT - IN.		
SUCT TEMP		
TONNAGE		
REFRIGERANT		

COOLING COIL CONSTRUCTION		
FINS		
TUBES		
CASING		
HEADERS		
OTHER COIL FEATURES		

HEATING BANK	#1	#2
QTY/MFG	1 / AERO	/
SERIES	11 FPI / 8 ROW	
TYPE	LCE, RET BEND	
CIRCUIT	—	
CSG HGT	48 TF	
NTL	6'-6"	
FA	48	
FV	930	
EAT/LAT	90 / 210	/
BTU/HR	5,600,000	
~~GPM~~ COND.	6000#/HR	
EWT/LWT	/	/
HEAD LOSS		
STEAM PRESS	5	
AIR FRICT.	2.6	

HEATING COIL CONSTRUCTION		
FINS	ALUM	
TUBES	COPPER — SS	
CASING	GALV	
HEADERS	STEEL — SS	
OTHER COIL FEATURES		

☐ INDEPENDENT COIL RACK ☐ CC ☐ HC
MATERIAL ____
☐ SS TROUGHS & DSPTS ☐ CC ☐ HC
☐ OTHER ____

FORM 5091

MARK: ______ S.O.#: ______

Buffalo Forge Company

CABINET ORDER DATA SHEET

☐ USE MODEL J DIMENSIONS FOR SIZE REQ'D ☐ USE SPECIFIC DIMENSIONS SHOWN

CASING CONSTRUCTION ☐ BUFFALO STANDARD DESIGN PER AC 205 ☐ MODIFICATIONS REQUIRED

DESIGN: ☒ SINGLE WALL w/INSUL. ☐ 2" DOUBLE WALL w/INSUL. OTHER ______
☐ SOLID INNER WALL ☐ PERF. INNER WALL ______

MATERIAL: ☒ GALVANIZED ☐ ALUMINUM ☐ OTHER ______

INSULATION: ______" IN. ______# DENSITY SPECIAL PANEL GAUGE ______ OUTER ______ INNER

CASING MODIFICATIONS ______

OUTDOOR DESIGN REQUIREMENTS ______

CASING DESIGN PRESSURE ______

CHANNEL BASE ☐ BFLO STD PER AC 205 ☐ MODIFICATIONS REQUIRED

CHANNEL SIZE 6 IN. ☒ STEEL PAINTED ☐ GALVANIZED ☐ SPECIAL PAINT ______

FLOOR SHEET 3/16" GA ☒ STEEL PAINTED ☐ GALVANIZED ☐ OTHER ______

☒ WELDED DRAIN PAN IN INTAKE PLENUM ☐ SS PAN IN ______

FLOOR INSULATION ______" IN ______# DENSITY with/without ______ gauge ______ coversheet

CHANNEL BASE MODIFICATIONS ______

SPECIAL PAINT - STANDARD PAINT IS ZINC RICH PRIMER (ZIPCOR) FOR ALL BLACK STEEL INCLUDING FAN, VIB BASE, CHANNEL BASE, FLOOR AND PANS. *DEFINE* OTHER PAINT REQUIREMENT HERE *IN DETAIL* CORLAR EPOXY ON EXTERIOR SURFACES

ACCESS DOORS QTY 2 SIZE 24×60 QTY ______ SIZE ______ ☐ DEAD LIGHTS
☐ STD DESIGN ☐ SPECIAL REQUIREMENTS ______

MARINE LIGHTS QTY ______ ☐ WIRED & SWITCHED AS SHOWN ON SKETCH

RECEPTACLES QTY ______ ☐ LOCATE ON SKETCH ______

FILTERS	BANK SIZE	FILTER SIZE	QTY	EFF	MFG-MODEL	CL	PREFILTER	SERVICE	EXTRA SETS
A	4 H x 4 W	24x24x22	16	30%	CAMBRIDGE HI CAP			☒ UP ☐ DOWN	
B	H x W							☐ UP ☐ DOWN	
C	H x W							☐ UP ☐ DOWN	
D	H x W							☐ UP ☐ DOWN	

☐ FILTER GAUGE ON BANK ______ TYPE ______ ☐ SHIP MEDIA DIRECT

ROLL FILTER ☐ VERT ☐ HORIZ ☐ MANUAL ☐ AUTO MFG ______ SIZE ______ SERVICE ☐ UP ☐ DOWN

☐ MISC FILTER DATA ______

DAMPERS

GALV or AL	SIZE	O or P	LOW LEAK	LOCATION

MFG ______ MODEL ______ OPER BY ______
MISC ______

LOUVER

GALV or AL	SIZE	LOCATION
GALV	8'x8'	INTAKE

MFG ______ MODEL ______
MISC ______

BLENDERS QTY ______ MFG-MODEL ______ FV ______ PRESS DROP " ______ " WG ______

HUMIDIFIERS ☐ STEAM GRID CAPACITY ______ LB/HR ______ STM PRES ______ MFG ______
MANIFOLD QTY ______ LENGTH ______ FT OPER ☐ PNEU ☐ ELEC MODEL ______
☐ MOUNT MANIFOLD & SHIP HUMIDIFIER BODY DIRECT MISC ______

FORM 5091

BUFFALO OK ______ .. ____
DATE ____________

Buffalo Forge Company
CABINET ORDER DATA SHEET

AC-2001
Page 1 of 4
10-1-87

Note: This data sheet must be completed and submitted for *all* cabinet orders. The Sales Rep is responsible for reviewing the customer specifications and putting all construction requirements on this data sheet. Refer to bulletin AC-205 for Buffalo standard design details. Changes on certified order will be charged to the customer.

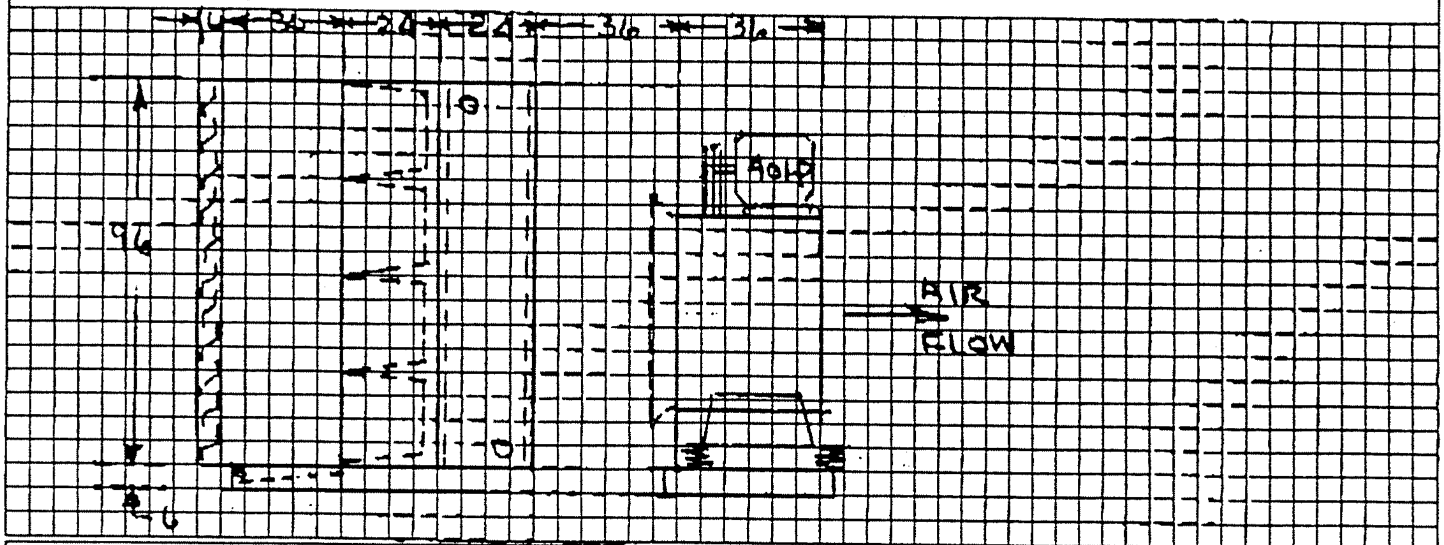
CUSTOMER ____________
USER ____________
ENGINEER GALSON & GALSON
QUANTITY 3 SIZE & TYPE 445 HVO

CUSTOMER P.O. NO. ____________
BR. OFFICE NO. ______ REP. ______
MARK ____________
BFC S.O.# ____________

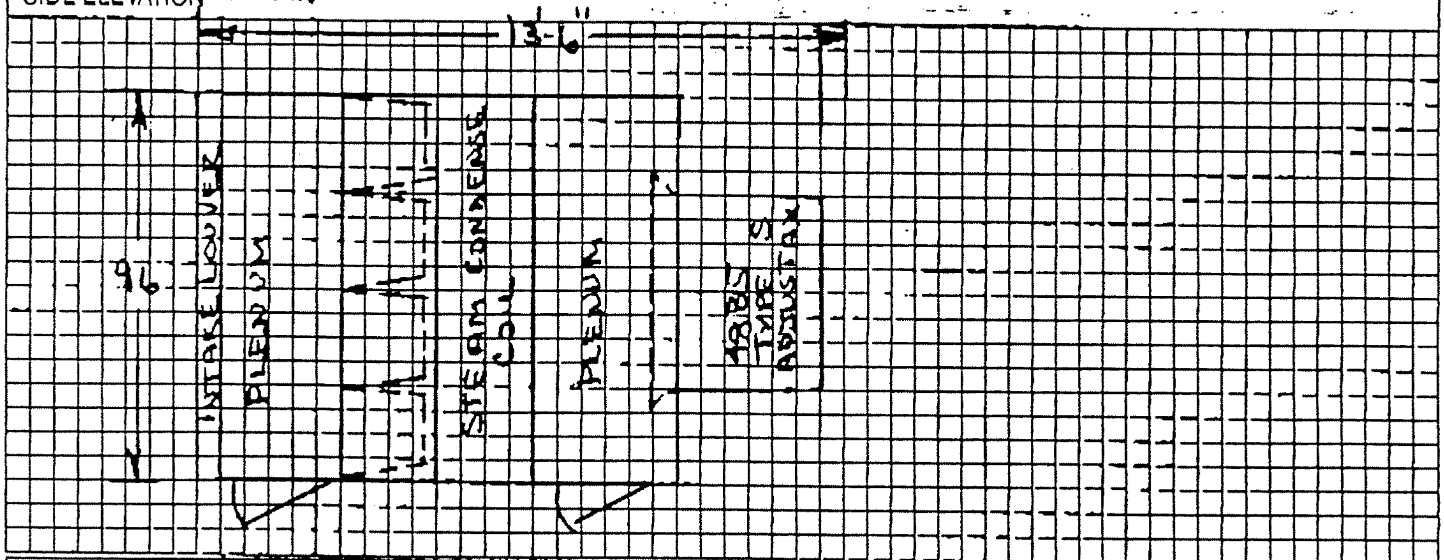
☐ UNIT SKETCH BELOW ☐ UNIT SKETCH ON ATTACHED PAGE

Draw a sketch of unit as close to scale as possible. Show all components and dimensions. Indicate location of doors, lights, receptacles, switches, motors, coil connections, filter service, shipping splits, fan discharge, damper and opening sizes.

~~PLAN~~ VIEW ELEV.



~~SIDE ELEVATION~~ PLAN



☐ INDOOR
☐ OUTDOOR
☐ ROOF PENETRATIONS UNDER UNIT
☐ FLOOR MOUNTED
☐ CURB MOUNTED
CURB BY ____________
☐ STEEL MOUNTED
☐ SUSPENDED

☐ SHIP IN ONE PIECE
☐ SHIP IN ______ PIECES AS SHOWN ON SKETCH

Special Note: Shipping splits require access to secure the bottom joint connection

☐ MAX WGT PER SECTION ________ LBS
☐ MAX OPENING SIZE FOR INSTALLATION ______ x ______

☐ PERFORMANCE CURVES REQ'D
☐ SOUND POWER REQ'D
☐ OTHER TESTS REQ'D (details on page 4)
☐ CUSTOMER INSPECTION REQ'D BEFORE SHIPMENT
☐ SPECIAL Q.C. REQUIRED (detail on page 4)

FORM 5091

TENT

Little River
INDUSTRIES, INC.

P.O. Box 505 • Highway 90 East
Quincy, Florida 32351
(904) 875-2300

August 30, 1988

Mr. Gary Hobbs
Galson & Galson
6601 Kirkville Road
East Syracuse, NY 13057

Dear Mr. Hobbs:

I am pleased to quote you on our Poly Steel Building for your requirements in Wide Beach, New York.

1 — 80' Wide x 115' Long x 40' High Poly Steel Building Including 2 End Panels	$43,272
Freight to Wide Beach	2,000
Complete Turn Key Erection Including Equipment and Labor	8,000
TOTAL	$53,272

The above building will be a larger version of the Poly Steel Building your company already owns and be comparable in design and quality.

Under separate cover, I'm sending our current brochure, technical specifications and fabric samples. If you have any questions, please call me toll free at 1-800-874-2900.

Sincerely,

Jack Ward

Jack Ward, Manager
Poly Steel Division

JW/mkc

SHELTERS

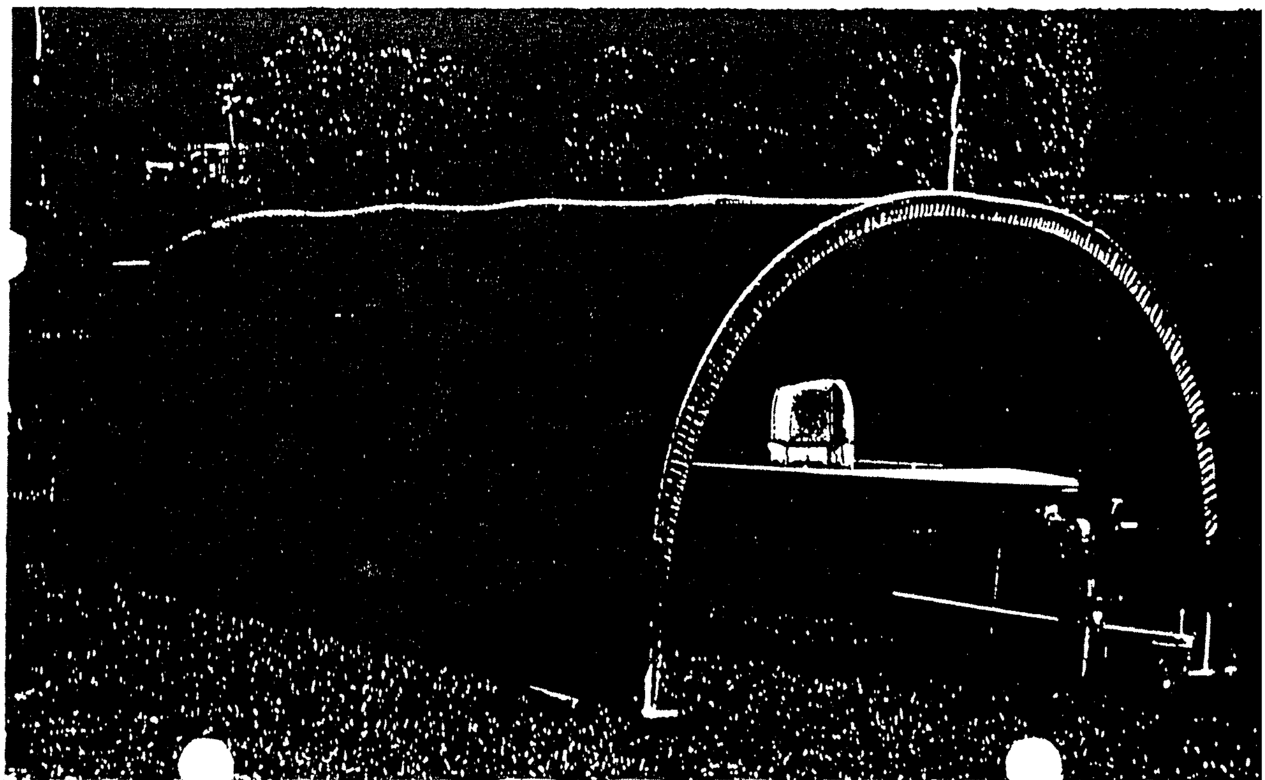
ost economical shelters
· Marine Slips.

C.

P.O. Box 505
Quincy, Florida 32351
(904) 875-2300

SHELTERS

Multi-Use Shelters: Among the most popular uses are Feed & Grain, Equipment, Boat, Plane, Car Storage, Temporary Enclosures, Maintenance & Repair, Greenhouses, and Swimming Pool Covers.



INGERSOLL-RAND
AIR COMPRESSORS

Air Center
Ingersoll-Rand Company
609 Cambridge Avenue
Syracuse, NY 13208
(315) 454-4483

August 30, 1988

Galson & Galson, Inc.
6601 Kirkville Rd.
East Syracuse, N.Y. 13057

Attention: Gary Hobbs- Project Engineer

Subject: Ingersoll-Rand 125HP Aircooled SSR Rotary Screw
Air Compressor Package

Reference: Ingersoll-Rand Proposal No. 2818JD

Dear Gary:

The budgetary proposal you requested for an Aircooled Air Compressor capable of delivering 525 ACFM at 125 PSIG for running Diaphram Pumps is attached.

Enclosed are brochures and our Terms and Conditions of Sale, form 3817.

If you have any questions, please feel free to contact me at 315-454-4483.

Very truly yours,

INGERSOLL-RAND AIR CENTER

James T. Dawson

James T. Dawson
Sales Engineer

INGERSOLL-RAND AIR COOLED ROTARY SCREW AIR COMPRESSOR PACKAGE

MODEL EP125
XF125

550 ACFM @ 125 PSIG
625 ACFM @ 100 PSIG

PRICE: $27,500.00

STANDARD FEATURES:

- 125 HP GENERAL ELECTRIC OR RELIANCE ELECTRIC HI-EFFICIENCY MOTOR 1.15 SERVICE FACTOR WITH CLASS F INSULATION AS OPPOSED TO STANDARD CLASS B. STANDARD "D" FLANGE 1770 RPM CAST IRON NEMA FRAME OFF THE SHELF
- 460V STAR DELTA REDUCED VOLTAGE STARTER MOUNTED AND WIRED IN THE COMPRESSOR PACKAGE
- ON LINE/OFF LINE WITH UPPER RANGE MODULATION CONTROL
- INTEGRAL AGMA 12 GEAR DRIVE FOR PERMANENT ALIGNMENT -- NO COUPLING -- NO MISALIGNMENT
- DUPLEX SET OF TAPERED ROLLER BEARINGS ON AIREND'S DISCHARGE FOR MAXIMUM ABSORPTION FO RADIAL AND THRUST LOADS. TAPERED ROLLER BEARINGS GIVE YOU LINE CONTACT AS OPPOSED TO POINT CONTACT INROLLER BEARINGS. ALSO, THERE IS A DOUBLE SET AS OPPOSED TO A SINGLE SET.
- COOLANT DAMS ARE LOCATED IN BOTH ENDS OF THE AIREND SO BEARINGS ALWAYS REMAIN LUBRICATED AND AVOID POSSIBLE DRY START
- FACTORY FILLED WITHSSR ULTRA COOLANT (2 YEARS OR 8000 HOURS BEFORE CHANGE)
- SOUND ATTENUATION ENCLOSURE
- START-UP SERVICE INCLUDED ON ALL EQUIPMENT
- SERVICE, PARTS, RENTAL COMPRESSORS AVAILABLE 24 HOUR/DAY -- OFFICES -- BUFFALO, ROCHESTER, AND SYRACUSE

F.O.B.: DAVIDSON, INC.
DELIVERY: 4-6 WEEKS ARO

AIR COOLED PACKAGE INCLUDES:

- 99.5% EFFICIENT INLET AIR FILTER (10 MICRON)
- RUGGED, TAPERED ROLLER BEARING AIREND WITH ASYMETRICAL LOBES
- MAINTENANCE-FREE, PERMANENT ALIGNMENT INTEGRAL AGMA 12 GEAR DRIVE
- 460 VOLT HIGH EFFICIENCY MOTOR WITH OVERSIZED BEARINGS, CLASS F INSULATION AND 100% COPPER LEADS AND WINDINGS
- EFFICIENT TWO-STAGE OIL SEPARATION SYSTEM
- FACTORY FILL INGERSOLL-RAND ULTRA COOLANT (8000 HOURS OR 2 YEARS)
- MOUNTED AND PREWIRED 460 VOLT REDUCED VOLTAGE STARTER WITH CONTROL TRANSFORMER
- BUILT-IN AND PREPIPED AIR COOLED AFTERCOOLER AND OIL COOLER
- MOISTURE SEPARATOR WITH AUTOMATIC DRAIN TRAP
- SOUND ATTENUATING ENCLOSURE
- ON LINE/OFF LINE WITH UPPER RANGE MODULATION CONTROL
- HEAVY STEEL BASELINE WITH FORKLIFT OPENINGS
- SOLID STATE CONTROL PANEL WITH U-L APPROVAL
- COMPLETE CONTROL AND MONITORING PANEL, INCLUDING:
  - -- POWER ON INDICATING LIGHTS
  - -- START/STOP SWITCHES
  - -- LOAD/NO LOAD SWITCHES
  - -- HOURMETER
  - -- INLET AIR FILTER MAINTENANCE INDICATOR
  - -- COOLANT FILTER MAINTENANCE INDICATOR
  - -- AIR SEPARATOR MAINTENANCE INDICATOR
  - -- DISCHARGE AIR PRESSURE GAUGE
  - -- DISCHARGE AIR TEMPERATURE GAUGE
- PROTECTIVE CONTROLS INCLUDE:
  - -- AIR PRESSURE SAFETY RELIEF VALVE
  - -- AIR DISCHARGE CHECK VALVE
  - -- HIGH DISCHARGE AIR TEMPERATURE SHUTDOWN
  - -- MAINMOTOR AND STARTER OVERLOAD PROTECTION
  - -- FAN MOTOR OVERLOAD PROTECTION

SSR Rotary Screw Air Compressors

INGERSOLL-RAND®
AIR COMPRESSORS

An innovative, new, large rotary compressor from Ingersoll-Rand

The Ingersoll-Rand SSR rotary screw compressors have been successful for so long that you may wonder why we changed them at all.

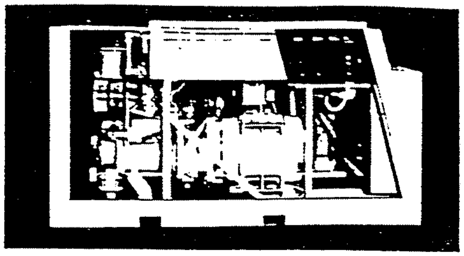
We have improved the compressor design to give you even greater reliability and better performance.

With this new package design get two special new features that will increase the life of your compressor system. Tapered roller bearings have been incorporated into all SSR airends to give you superb performance and reliability, and a dedicated high efficiency motor, which results in greater operating efficiency and lower operating costs.

Energy efficiency is of real value in these large compressors. So we've equipped all our SSR's with the **most efficient** capacity control concept on the market, our exclusive On-Line/Off-Line control with upper range modulation as standard equipment.

In addition, Ingersoll-Rand SSR models thru 350 hp include integral coolers which mean much lower installation costs.

These SSR compressors retain all the features and benefits you've come to rely on over the years like integral gear drive, efficient separation system



and solid state controls. And access for routine maintenance is a snap with the SSR's easy-open enclosure panel.

Best of all, the new SSR is a complete compressor package including all of these standard features:

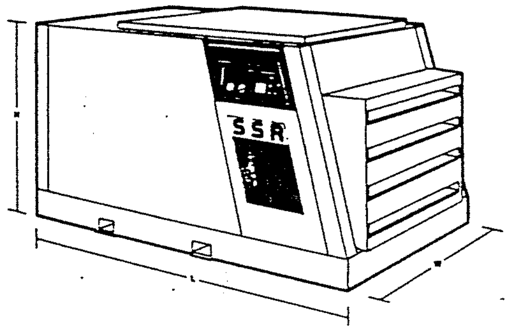
Standard Equipment

- Tapered roller bearing airend.
- Exclusive dedicated high efficiency motor with oversized bearings and class F insulation.
- Rugged, proven integral gear drive.
- Efficient coolant separation system (less than 3 ppm carryover).
- Mounted full voltage motor starter.
- Complete control panel.
- Power-saving on-line/off-line control with upper range modulation.
- Full complement of protective controls.
- Integral aftercooler.
- Sound-attenuating enclosure (85 dbA*).
- Factory fill of exclusive SSR Ultra Coolant.
- Choice of air-cooled or water-cooled design.
- Solid state U.L. approved controls.

Optional Equipment

- Star Delta reduced voltage starting
- Low-sound enclosure (as low as 76dbA*).
- Energy Recovery System (ERS).
- SSR H-1F Food Grade Coolant (Factory fill).
- Automatic start/stop control.
- Auto control selector
- Protective shutdown annunciator.
- Multi-unit sequencer or Energy Management Center (EMC).
- TEFC motor
- High dust inlet filter.
- High ambient cooling options.

*measured in accordance with CAGIPNEUROP test code.



Specifications: 60 Hertz

Model	H.P.	FAD	Full Load Pressure
SSR XF 125	125	620	100
SSR EP 125	125	540	125
SSR HP 125	125	480	150
SSR XF 150	150	740	100
SSR EP 150	150	650	125
SSR HP 150	150	530	150
SSR XF 200	200	980	100
SSR EP 200	200	870	125
SSR HP 200	200	745	150
Dimensions (in.)	**L**	**W**	**H**	**Wt.(Lbs.)**
	112	69	57	5135-5480

Model	H.P.	FAD	Full Load Pressure	
SSR XF 250	250	1240	100	
SSR EP 250	250	1100	125	
SSR HP 250	250	990	150	
Dimensions (in.)	**L**	**W**	**H**	**Wt.(Lbs.)**
	112	84	65	9450

Model	H.P.	FAD	Full Load Pressure	
SSR XF 300	300	1420	100	
SSR EP 300	300	1260	125	
SSR HP 300	300	1170	150	
SSR XFE 300	300	1550	100	
SSR EPE 300	300	1365	125	
SSR HPE 300	300	1235	150	
Dimensions (in.)	**L**	**W**	**H**	**Wt.(Lbs.)**
	112	84	65	9710-11080

Model	H.P.	FAD	Full Load Pressure	
SSR XF 350	350	1750	100	
SSR EP 350	350	1550	125	
SSR HP 350	350	1365	150	
SSR XF 400	400	1950	100	
SSR EP 400	400	1750	125	
SSR HP 400	400	1515	150	
SSR EP 450	450	1900	125	
SSR HP 450	450	1700	150	
Dimensions (in.)	**L**	**W**	**H**	**Wt. (Lbs.)**
	112	84	65	11380-12640

INGERSOLL-RAND®
AIR COMPRESSORS

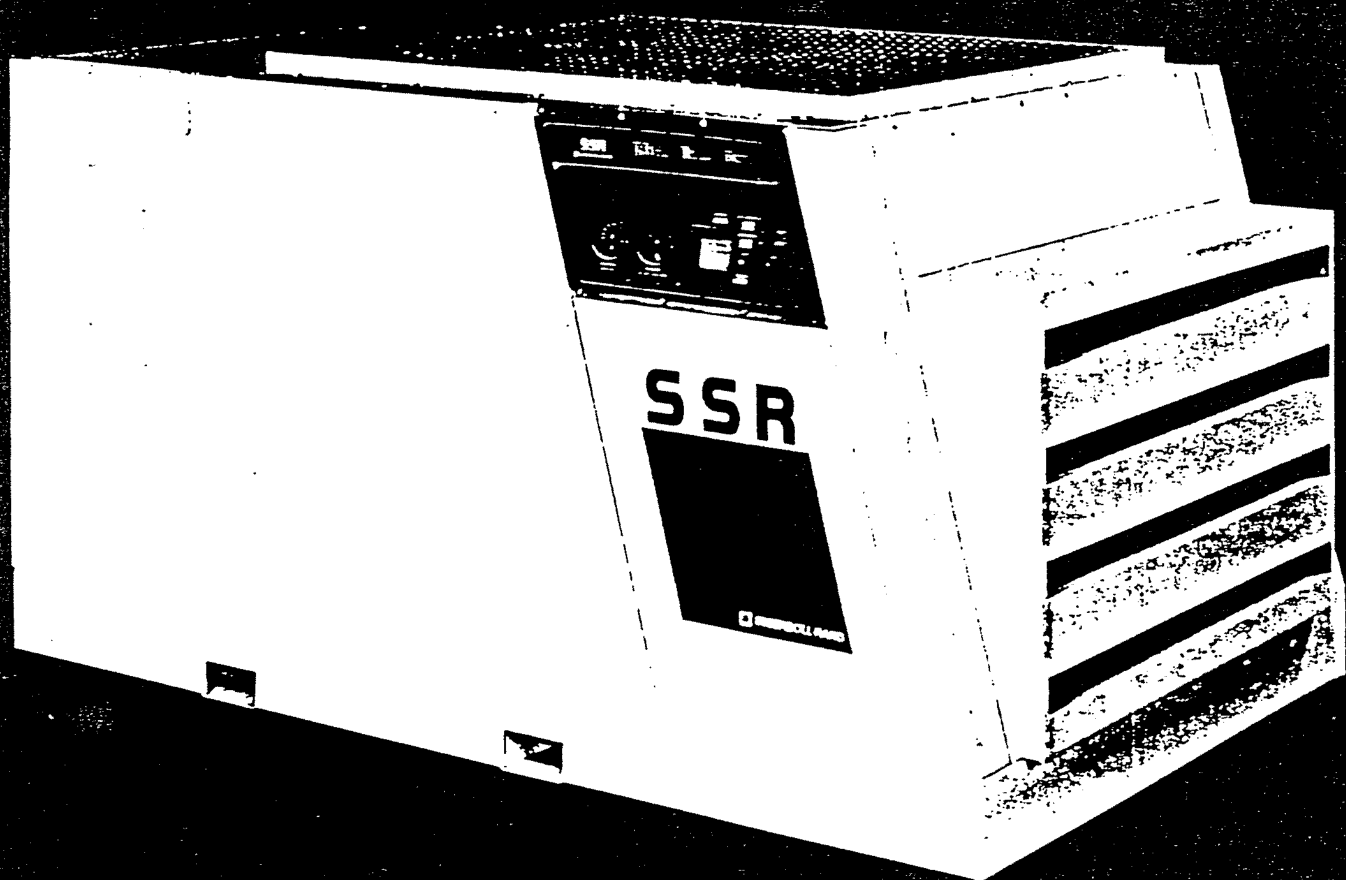
Air Compressor Group
Rotary Compressor Division

Ingersoll-Rand Company
Charlotte, North Carolina 28224

Form 3850-C
Printed in U S A

SSR Rotary Screw Air Compressors 125–450 Horsepower

INGERSOLL-RAND®
AIR COMPRESSORS



TERMS OF PAYMENT (See Note 1)

Net 30 days unless otherwise stated.

Orders in excess of $100,000 are subject to progress payments as follows:

10% of order value 30 days from date of customer's purchase order.

20% of order value after passage of ⅓ of the time from the date of the customer's order to the originally scheduled shipment date.

30% of order value after passage of ⅔ of the time from the date of the customer's order to the originally scheduled shipment date.

40% net 30 days from date of shipment.

All payments to be in U.S. dollars. Pro rata payments to apply as shipments are made.

Escalation Policy set out on the reverse hereof applies.

SHIPMENT

Shipments will be made in about ______ weeks. (See Note 2)

Shipments are F.O.B. Point of Shipment, with freight prepaid and invoiced at cost.

DRAWINGS

STANDARD PRODUCTS: Drawings will be submitted in about ______ weeks. (See Note 2)

SPECIALLY ENGINEERED PRODUCTS: Drawings will be submitted in about ______ weeks. (See Note 2)

CANCELLATION

If an order is cancelled, payment must be made for all outside charges, actual engineering and drafting hours, plus a reasonable percentage of the order to cover other overhead and S & A cost.

NOTE 1 — All terms of payment are subject to approval of Ingersoll-Rand Company's Credit Department.

NOTE 2 — After acceptance of the order by an Executive Officer of Ingersoll-Rand Company and receipt at Ingersoll-Rand Company's factory of complete information necessary for manufacturing.

Form 3814

COMPLETES AND ACCESSORIES

Clause I.

A For all STANDARD PRODUCTS utilizing standard, unmodified motors; standard control panels without modifications and no print approval required:

Price Policy

a. Prices are firm for 180 days from date of order provided shipment is made within this 180 day period. When shipment is more than 180 days from date of order, and if our prices have increased since the date of order, the invoice price will be that in effect on date of actual shipment, but limited to a maximum escalation on the order price not to exceed one and one half percent per month compounded from date of order. However if shipment is delayed by the customer for his convenience, which includes delays in issuing the formal purchase order, the price (and price policy with respect to escalation) becomes that in effect on date of shipment.

b Major accessories (such as motors, starters, panels and filters) and/or major non price book items are subject to the same price increase as made effective by our suppliers prior to date of shipment even if shipment is made within the above 180 days.

c. All quotations for this class equipment are valid for a period not to exceed 30 days from date of quotation. The company reserves the right to amend such quotations at any time.

Clause III.

A For ALL SPECIAL PRODUCTS (including any with non standard motors or control panels or with print approval) or where shipment is required in more than 180 days but less than eighteen (18) months:

Price Policy

B The prices quoted are subject to adjustment upward or downward to allow for changes in Seller's material and labor costs from the month of submittal of the company's proposal to the month of shipment.

1 Definitions

For the purpose of this pricing policy, the following definitions apply:

a "Labor Index" shall be the "Average Hourly Earnings for SIC Code 3563 as determined and reported monthly by the Bureau of Labor Statistics, U.S. Department of Labor in "Employment and Earnings."

b "Material Index" shall be SIC Code 101 as determined monthly by the Bureau of Labor Statistics, U.S. Department of Labor in "Producer Prices and Price Indexes."

c. "Base Month" shall be the month of submittal of the company's proposal.

d. "Base Labor Index" is the Labor Index for the Base Month.

e "Base Material Index" is the Material Index for the Base Month.

2. Price Adjustment

a For the purpose of price adjustment, 30 percent of the contract price shall be deemed to represent the labor content and 70 percent of the contract price shall be deemed to represent the material content.

b The price adjustment for both the labor and material content will be made equal to the percent by which their respective Indexes for the month of shipment (or the latest published Indexes) is greater or less than their respective Indexes for the Base Month. (If the latest published Index is used, the Base Month will be adjusted accordingly.)

c Where progress payments apply, the adjustment will be calculated as above and added to the final invoice. If there is more than one billing, the total price adjustment as described above will be included on the invoice with the complete machine.

3 General

a Should the Indexes herein specified be terminated or the basis of their calculation modified, similar Indexes or other methods of price adjustment shall be selected by mutual agreement.

b The Base Labor Index shall be to the nearest second decimal place. The Base Material Index shall be to the nearest first decimal place. All last significant integers shall be rounded to the next highest integer if the succeeding integer is five or more.

c The price adjustment percentage will be calculated to the nearest one tenth of one percent

d Should any change of contract specifications prior to shipment result in a change in contract price, the new price shall be considered, for the purpose of adjustment, as having been in effect since the Base Month.

e The term "shipment" as used in this provision shall mean shipment as confirmed by the Seller. If shipment is delayed due to causes beyond the Seller's reasonable control, including, but not limited to, acts of God, acts of Buyer, acts of Civil or Military authority, Government orders or regulations, strikes, work stoppages, fires, accidents, wars, riots, floods, epidemics, delays in transportation, or inability on account of causes beyond Seller's reasonable control to obtain materials, labor, or facilities, the month of actual shipment shall be used for price adjustment.

Major Accessories (such as motors, starters, panels, and filters) and/or major non price book items are subject to the same price increase as made effective by our suppliers prior to date of shipment. For shipments of eighteen (18) months or more, please contact Product Support.

SPARE PARTS AND FIELD SERVICE

All spare parts will be invoiced at price in effect on date of shipment. Field Service charges shall be price in effect at the time the work is completed

Prices are Subject to Change Without Notice
Ingersoll-Rand Company, Woodcliff Lake, NJ 07675

1. General

The Terms and Conditions of Sale outlined herein shall apply to the sale by Ingersoll-Rand Company (hereinafter referred to as Company) of products, equipment and parts relating thereto (hereinafter referred to as Equipment). Unless prior written agreement is reached, it shall be understood that the Company's proceeding with any work shall be in accordance with the terms and conditions outlined herein.

The Company will comply with the Federal, State and local laws and regulations in effect on the date of the Company's proposal as they may apply to the manufacture of the Equipment. Such compliance shall not include the installation, location, use and/or operation of the Equipment nor its use in conjunction with other equipment or apparatus.

2. Title and Risk of Loss

Title and risk of loss or damage to the Equipment shall pass to the Purchaser upon tender of delivery F.O.B. manufacturing facility unless otherwise agreed upon by the parties, except that a security interest in the Equipment shall remain in the Company, regardless of mode of attachment to realty or other property, until full payment has been made therefor. Purchaser agrees upon request to do all things and acts necessary to perfect and maintain said security interest and shall protect Company's interest by adequately insuring the Equipment against loss or damage from any cause wherein the Company shall be named as an additional insured.

3. Assignment

Neither party shall assign or transfer this contract without the prior written consent of the other party. As a condition to any such written consent, such assignment shall be subject to the terms and conditions herein and no greater rights or remedies shall be available to the assignee.

4. Delivery and Delays

Delivery dates shall be interpreted as estimated and in no event shall dates be construed as falling within the meaning of "time is of the essence".

The Company shall not be liable for any loss or delay due to war, riots, fire, flood, strikes or other labor difficulty, acts of civil or military authority including governmental laws, orders, priorities or regulations, acts of the Purchaser, embargo, car shortage, wrecks or delay in transportation, inability to obtain necessary labor or materials from usual sources, faulty forgings or castings, or other causes beyond the reasonable control of the Company. In the event of delay in performance due to any such cause, the date of delivery or time for completion will be adjusted to reflect the actual length of time lost by reason of such delay. The Purchaser's receipt of Equipment shall constitute a waiver of any claims for delay.

5. Taxes

The price does not include any present or future Federal, State, or local property, license, privilege, sales, use, excise, gross receipts or other like taxes or assessments which may be applicable to, measured by, imposed upon or result from this transaction or any services performed in connection therewith. Such taxes will be itemized separately to Purchaser, who shall make prompt payment to the Company. The Company will accept a valid exemption certificate from Purchaser if applicable. If such exemption certificate is not recognized by the governmental taxing authority involved, Purchaser agrees to promptly reimburse the Company for any taxes covered by such exemption certificate which the Company is required to pay.

6. Set Offs

Neither Purchaser nor any affiliated company or assignee shall have the right to claim compensation or to set off against any amounts which become payable to the Company under this contract or otherwise.

7. Patents

The Company shall defend any suit or proceeding brought against the Purchaser and shall pay any adverse judgement entered therein so far as such suit or proceeding is based upon a claim that the use of the Equipment manufactured by the Company, and furnished under this contract constitutes infringement of any patent of the United States of America, providing the Company is promptly notified in writing and given authority, information and assistance for defense of same, and the Company shall, at its option, procure for the Purchaser the right to continue to use said Equipment, or to modify it so that it becomes non-infringing, or to replace the same with non-infringing equipment, or to remove said Equipment and to refund the purchase price. The foregoing shall not be construed to include any agreement by the Company to accept any liability whatsoever in respect to patents for inventions including more than the Equipment furnished hereunder, or in respect of patents for methods and processes to be carried out with the aid of said Equipment. The foregoing states the entire liability of the Company with regard to patent infringement.

8. Warranty

The Company warrants that the Equipment manufactured by it and delivered hereunder will be free of defects in material and workmanship for a period of twelve months from the date of placing the Equipment in operation or eighteen months from the date of shipment (15 months with respect to Centac Units), whichever shall first occur. The Purchaser shall be obligated to promptly report any failure to conform to this warranty, in writing to the company within said period, whereupon the Company shall, at its option, correct such nonconformity, by suitable repair to such Equipment or, furnish a replacement part F.O.B. point of shipment, provided the Purchaser has stored, installed, maintained and operated such Equipment in accordance with good industry practices and has complied with specific recommendations of the Company. Accessories or equipment furnished by the Company, but manufactured by others, shall carry whatever warranty the manufacturers have conveyed to the Company and which can be passed on to the Purchaser. The Company shall not be liable for any repairs, replacements, or adjustments to the Equipment or any costs of labor performed by the Purchaser or others without the Company's prior written approval.

The effects of corrosion, erosion and normal wear and tear are specifically excluded. Performance warranties are limited to those specifically stated within the Company's proposal. Unless responsibility for meeting such performance warranties are limited to specified shop or field tests, the Company's obligation shall be to correct in the manner and for the period of time provided above.

THE COMPANY MAKES NO OTHER WARRANTY OR REPRESENTATION OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.

Correction by the Company of nonconformities whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of the Company for such nonconformities, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise with respect to or arising out of such Equipment.

The Purchaser shall not operate Equipment which is considered to be defective, without first notifying the Company in writing of its intention to do so. Any such use of Equipment will be at the Purchaser's sole risk and liability.

9. Limitation of Liability

The remedies of the Purchaser set forth herein are exclusive, and the total liability of the Company with respect to this contract or the Equipment and services furnished hereunder, in connection with the performance or breach thereof, or from the manufacture, sale, delivery, installation, repair or technical direction covered by or furnished under this contract, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, shall not exceed the purchase price of the unit of Equipment upon which such liability is based.

The Company and its suppliers shall in no event be liable to the Purchaser, any successors in interest or any beneficiary or assignee of this contract for any consequential, incidental, indirect, special or punitive damages arising out of this contract or any breach thereof, or any defect in, or failure of, or malfunction of the Equipment hereunder, whether based upon loss of use, lost profits or revenue, interest, lost goodwill, work stoppage, impairment of other goods, loss by reason of shutdown or non-operation, increased expenses of operation, cost of purchase of replacement power or claims of Purchaser or customers of Purchaser for service interruption whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise.

10. Nuclear Liability

In the event that the Equipment sold hereunder is to be used in a nuclear facility, the Purchaser shall, prior to such use, arrange for insurance or governmental indemnity protecting the Company against liability and hereby releases and agrees to indemnify the Company and its suppliers for any nuclear damage, including loss of use, in any manner arising out of a nuclear incident, whether alleged to be due, in whole or in part to the negligence or otherwise of the Company or its suppliers.

11. Governing Law

The rights and obligations of the parties shall be governed by the laws of the State of New Jersey.

12. Execution

The Company shall not be bound by any contract or any modification thereto until approved in writing by an officer of the Company. The contract when so approved shall supersede all previous communications, either oral or written.

SIEWERT EQUIPMENT CO. INC.
PUMP & MIXER SPECIALIST
175 AKRON ST.
ROCHESTER, N.Y. 14609
(716) 482-9640

page 1 of 4

SIEWERT TELEFAX...DATE 8/29/88
OUR FAX PHONE: 716-482-4149
from: Wayne Dodsworth
TO: GALSON AND GALSON
att'n: GARY HOBBS
SUBJECT: GRC - EBASCO
file no: S-88-9090G (REV.1)

AS REQUESTED PLEASE FIND OUR REVISED QUOTATION AS FOLLOWS:

#1- 500 gpm @ 25 PSI - 200°F - ROBBINS AND MEYERS - MOYNO PUMP SERIES 2000 SIZE 1J175G1-SSB ALL 316SS w/ EPDM STATOR, MECHANICAL VARIABLE SPEED CONTROL (DESIGN SPEED 300 RPM @ 40 HP). SEVERE DUTY 3/60/460 V, BASE, GUARD, CPLG, ASSEMBL[Y]
NET EA ——————————> $35,924.00

#2 - 200 gpm @ 25 PSI - 300°F SIZE 1G065G1 SSF ALL 316SS w/ FLUROELASTOMER STATOR (15 HP @ 300 RPM) NET ea ——> $21148.00

DELIVERY 14-16 WEEKS

HAVE ASSUMED WATER LIKE VISCOSITY, 1/4" ø SOLI[DS] 10% SOLIDS, MEDIUM ABRASION.

REGARDS
Wayne Dodsworth

Typical Specification for Moyno "2000" Pumps Type G1

Job. Ref. ____________________

Equip. Ref. ____________________

The ____________________ (service) pump(s) shall be of the heavy duty, positive displacement, ______________(number of stages) stage, progressing cavity type. The pump(s) shall be cradle mounted to allow the normally vertical suction port to be rotated to any angle perpendicular to the centerline to facilitate piping connections.

(The bearing and suction housings of the pump shall be thick-walled cast iron.) (The bearing housing of the pump shall be thick-walled cast iron and the suction housing cast stainless steel.) All cast parts will be free of sand holes, blow holes, and other defects. The suction housing shall incorporate two rectangular inspection ports, 180° apart, to permit access to the suction housing interior without disconnecting piping.

The suction and discharge connections shall be flat face flanges with bolt hole dimensions and spacing to ANSI Standards. The suction flange(s) shall be ______________ (125) (150) lb., the discharge flange(s) ______________ (125) (150) (300) (600) lb.

The (alloy steel) (stainless steel) rotor shall be a machined and polished single helix with a nominal chrome plate thickness of .010 inches for maximum abrasion resistance.

The stator shall be of double helix configuration with the molded ______________ (type of elastomer) elastomer chemically bonded to a steel tube. The stator shall be fastened to the suction housing and discharge flange with removable clamp rings to facilitate stator removal. The stator seals shall be designed to prevent the material being pumped from contacting the stator bonding and tube.

The universal joints shall be of the grease lubricated crowned gear type, totally enclosed and protected by a wire reinforced elastomeric seal. Mechanical components of the universal joints shall be designed to operate for 10,000 hours at the manufacturer's published maximum speeds and pressures.

A rigid, splined connecting rod shall connect the gear joints of the drive shaft and eccentrically moving rotor. The connecting rod shall pass through the shaft seal area inside the hollow drive shaft quill so that no eccentric loads are imparted on the shaft seal area.

The drive shaft shall be of one piece construction through the bearings and shaft seal area. This design shall permit disassembly of the universal joints without affecting the alignment of the shaft in the shaft sealing area. The quill portion of the shaft shall be replateable.

The bearings will be of the grease lubricated, tapered roller bearing type with diverging pressure angles for maximum shaft stability. Bearings are to be designed for a minimum B-10 life of 30,000 hours under maximum operating conditions and will not require periodic relubrication. The bearings shall be protected from contaminants by means of a bearing cover plate bolted to the bearing housing.

The stuffing box shall be equipped with a split packing gland and split teflon lantern ring to permit repacking of the pump without removing the bearings or drive shaft components. Fittings will be provided for (grease) (water) lubrication of the packing.

or

The stuffing box shall be equipped with a mechanical seal, with fittings provided for lubrication.

PERFORMANCE SPECIFICATION

The ____________________ pump(s) shall be capable of pumping ______________gpm of ____________________ against ______________ ft. of total discharge head at a maximum of ______________ rpm. The minimum driver horsepower shall be ______________.

ROBBINS MYERS

Pg 3 of 4

Section: **Performance Data**
Date: May 1, 1987

1 J 175 G1

Performance Data

Curve 17.00

Elements: 175

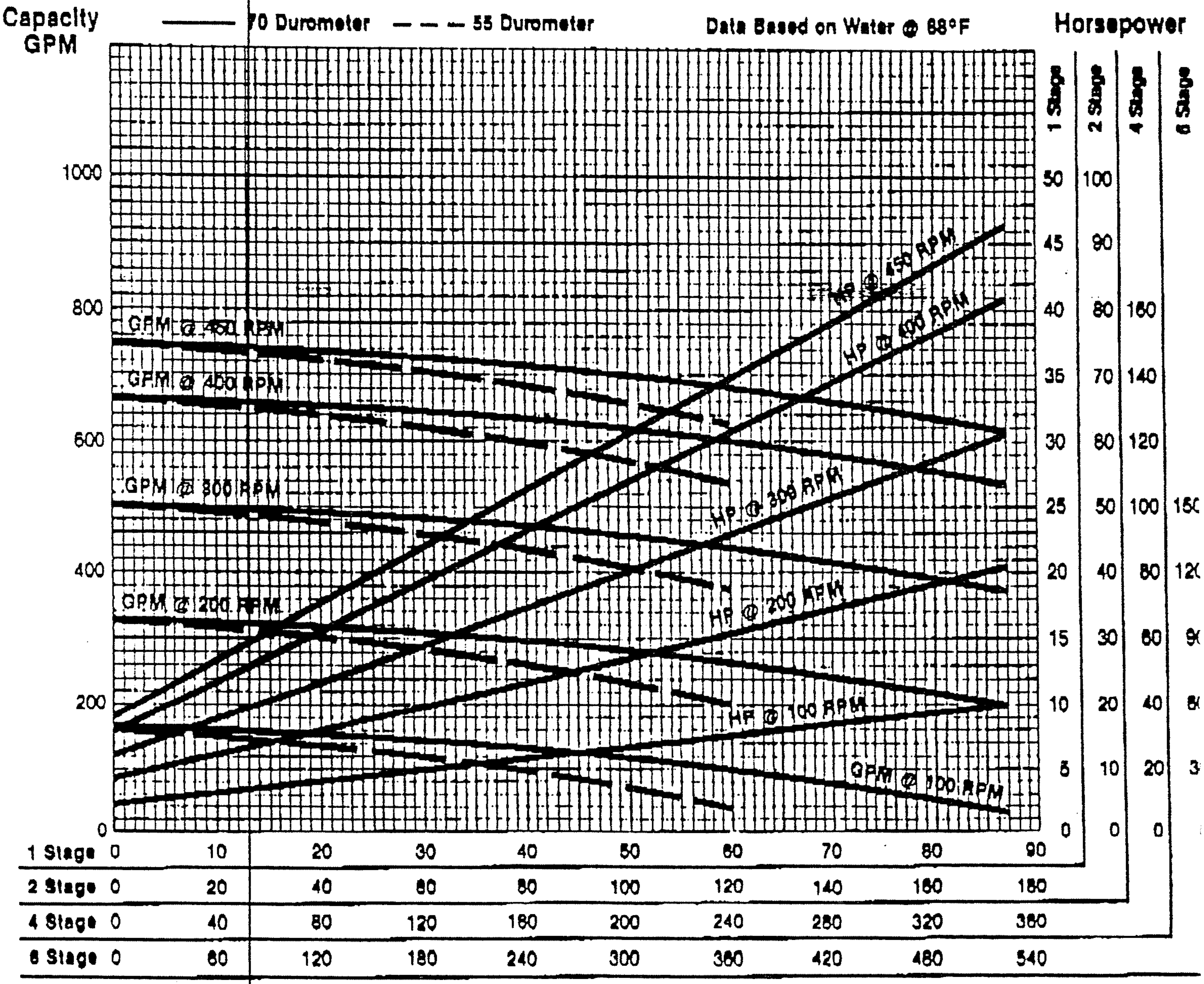
Stages: 1, 2, 4, 6

Drive Ends: H, J, K

Use appropriate HP and pressure scales for the number of stages required.

NOTE: Pressure limits rated at 87 psi/stage (70 Duro.) Some models have additional limits. Please consult factory before making final selection.

		100	200	300	400	450
RPM		100	200	300	400	450
NPSH Required — (Ft.)		1.7	3.5	7.4	11.8	14.1
Min. HP Minimum HP values listed here are to be added to the Drive End HP values below.	1 STG	7-1/2	15	20	25	30
	2 STG	10	20	30	40	40
	4 STG	15	30	40	50	60
	6 STG	20	40	60	75	75
Drive End HP Must be added to HP value from curve.	H	0.60	1.10	1.70	2.30	2.80
	J	0.70	1.40	2.00	2.70	3.40
	K	1.30	2.60	3.90	5.20	5.90



Pg 4 of 4

ROBBINS MYERS

Section:
Performance Data
Date: May 1, 1987

Performance Data

1G065 G71

Curve 14.00

Elements: 065

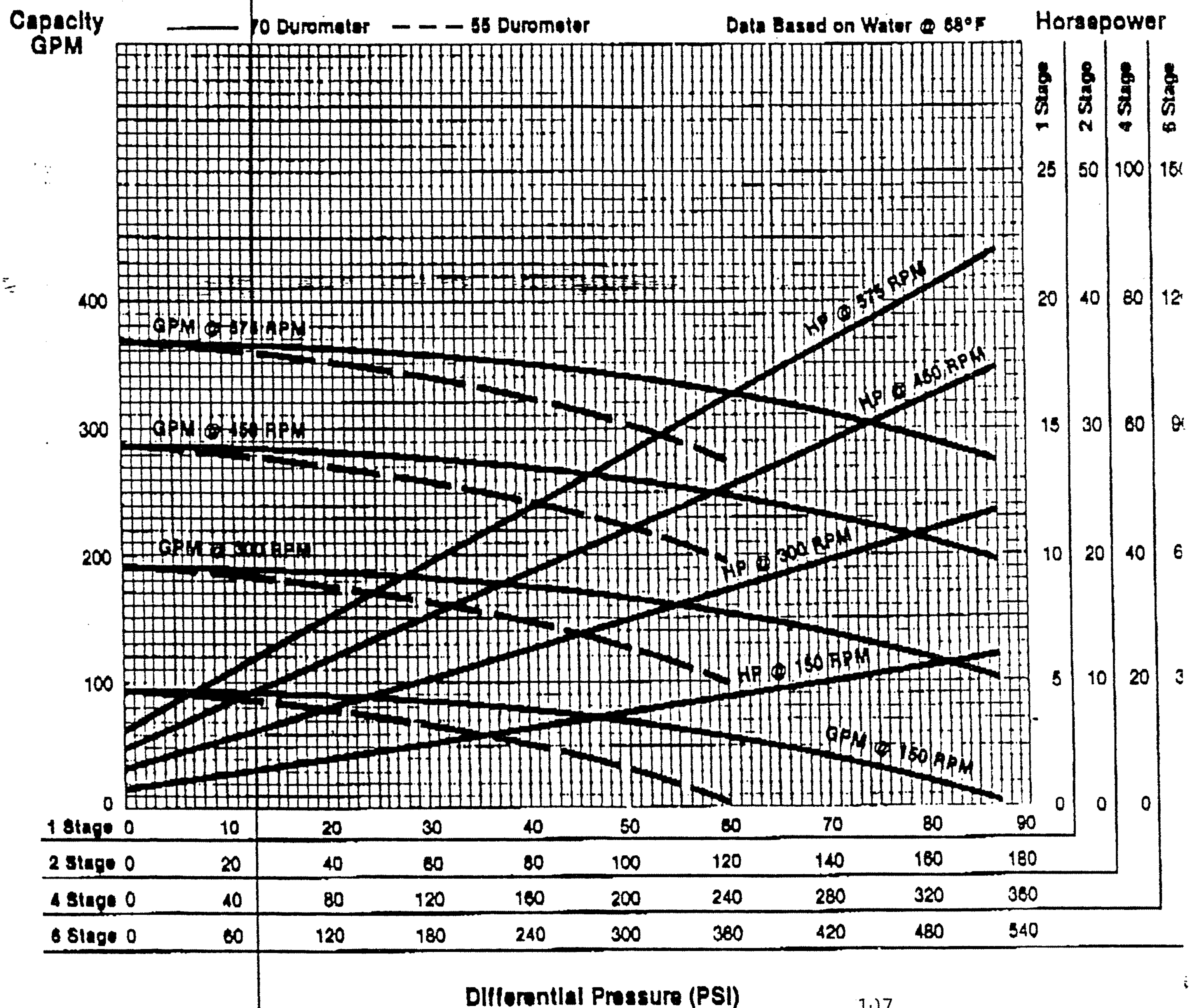
Stages: 1, 2, 4, 8

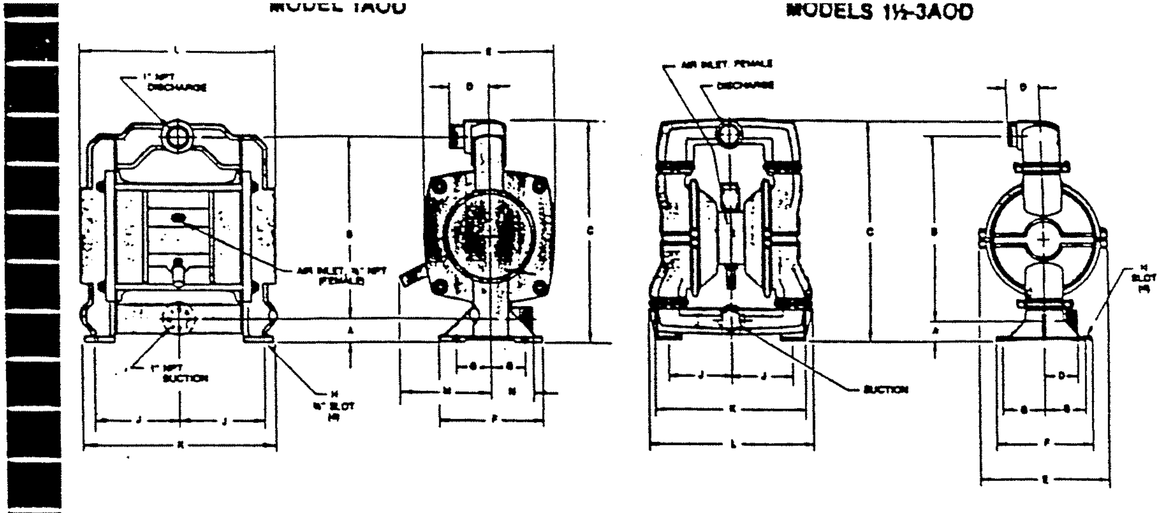
Drive Ends: F, G, H, J

Use appropriate HP and pressure scales for the number of stages required.

NOTE: Pressure limits rated at 87 psi/stage (70 Duro.) Some models have additional limits. Please consult factory before making final selection.

	RPM	150	300	450	575
	NPSH Required (Ft.)	1.9	3.8	8.3	12.2
Min. HP	1 STG	5	7-1/2	15	15
Minimum HP values listed here are to be added to the Drive End HP values below.	2 STG	7-1/2	10	15	20
	4 STG	10	20	25	30
	8 STG	15	25	40	50
Drive End HP	F	0.38	0.76	1.10	1.50
	G	0.53	1.10	1.60	2.00
Must be added to HP value from curve.	H	0.90	1.70	2.60	3.30
	J	1.00	2.00	3.00	3.90





MODEL	SUCT.	DISCH.	A	B	C	D	E	F	G	H	J	K	L	M	N	AIR INLET
1AOD-A	1 MNPT	1 MNPT	1 9/16	10 3/8	12 5/8	2 7/8	7 1/2	8	2	3/8	4 7/8	11 13/16	11 3/16	5 1/2	2 11/16	3/8 NPT
1½AOD-A	1½MNPT	1½MNPT	2	13 3/4	17 1/16	3 3/4	12	7	2 15/16	7/16	6 9/16	15 1/8	16 7/8	—	—	3/4 NPT
2AOD-A	2 MNPT	2 MNPT	2 3/16	20 9/16	24 5/16	4 1/2	14 3/4	10 3/4	4 5/8	1/2	7 1/8	17 1/4	18 3/4	—	—	3/4 NPT
3AOD-A	3 MNPT	3 MNPT	3 1/8	25 9/16	30 7/16	5 11/16	14 3/4	13 1/2	6	5/8	7 3/4	19 1/2	21 7/16	—	—	
1AOD-S	1 FNPT	1 FNPT	1 9/16	10 3/8	12 5/8	1 5/8	7 1/2	6	2	3/8	4 7/8	11 13/16	11 13/16	5 1/2	1 7/16	3/8 NPT
1½AOD-S	1½FNPT	1½FNPT	2	13 3/4	17 1/16	2 1/16	12	9	3 15/16	7/16	6 9/16	15 1/8	16 7/8	—	—	3/4 NPT
2AOD-S	2 FNPT	2 FNPT	2 3/16	20 9/16	24 5/16	2 13/16	14 3/4	10 3/4	4 5/8	1/2	7 1/8	17 1/4	18 3/4	—	—	3/4 NPT
1AOD-C	1 FNPT	1 FNPT	1 9/16	12	14 1/4	1 7/16	7 1/2	7	2 3/4	7/16	4 3/4	11 5/8	11 5/8	5 1/2	1 7/16	3/8 NPT
1½AOD-C	1½FNPT	1½FNPT	1 5/8	14 1/2	17 3/4	1 3/4	12	8	3 7/16	1/2	6 9/16	16 1/16	16 5/16	—	—	3/4 NPT
2AOD-C	2 FNPT	2 FNPT	2	21 1/16	24 3/8	2 1/16	14 3/4	10 3/4	4 11/16	9/16	6 15/16	17 7/8	17 7/8	—	—	3/4 NPT
3AOD-C	3 FNPT	3 FNPT	2 1/2	23 3/4	28 3/8	3	14 3/4	11 3/4	5 3/16	9/16	7 7/16	19 7/8	19 7/8	—	—	3/4 NPT

ALL DIMENSIONS ARE SHOWN IN INCHES.

ITT Marlow's AOD™

The proof is in the pump.

Marlow provides you with a distinct advantage when in comes to pumping technology: well over 60 years experience. We've been designing high quality, durable pumps, requiring minimum service and maintenance, for your specific requirements since 1924. No other manufacturer has achieved the reliability of Marlow ... your assurance that when an ITT Marlow pump goes on-line ... it stays on-line.

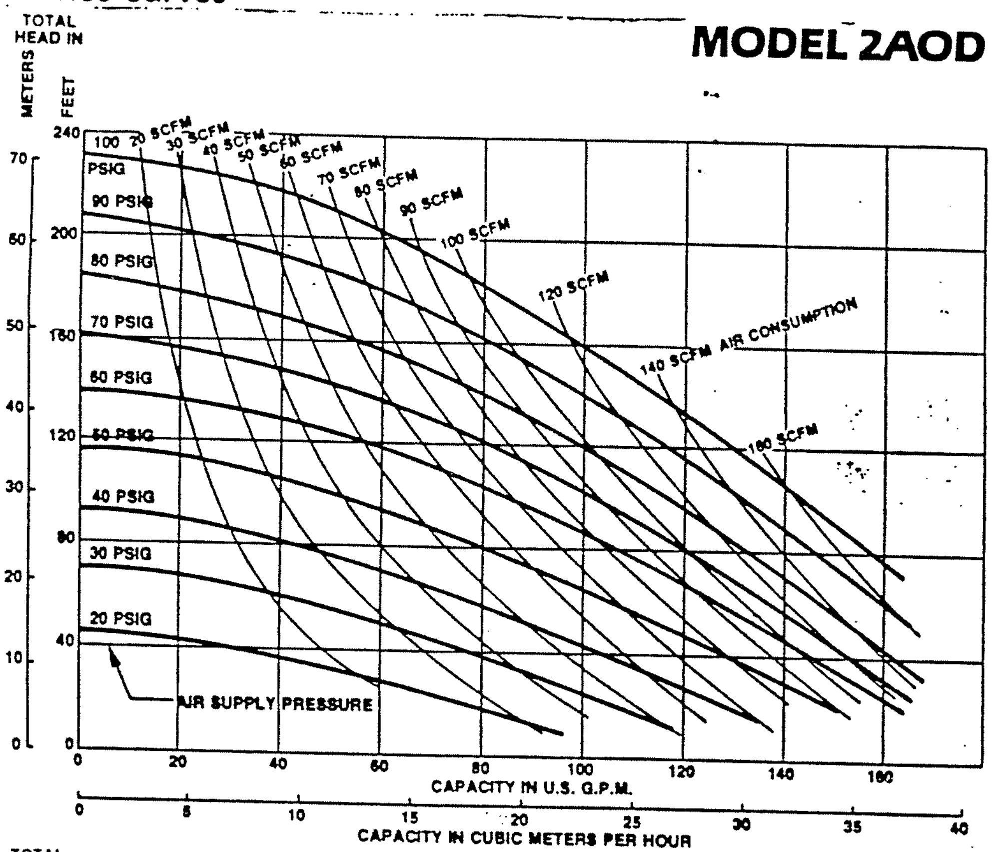
For more information about the new Marlow Air-Operated Diaphragm Pump, call or write ITT Marlow Pumps. Our engineers are ready to help you solve your pumping problems.

Authorized Distributor

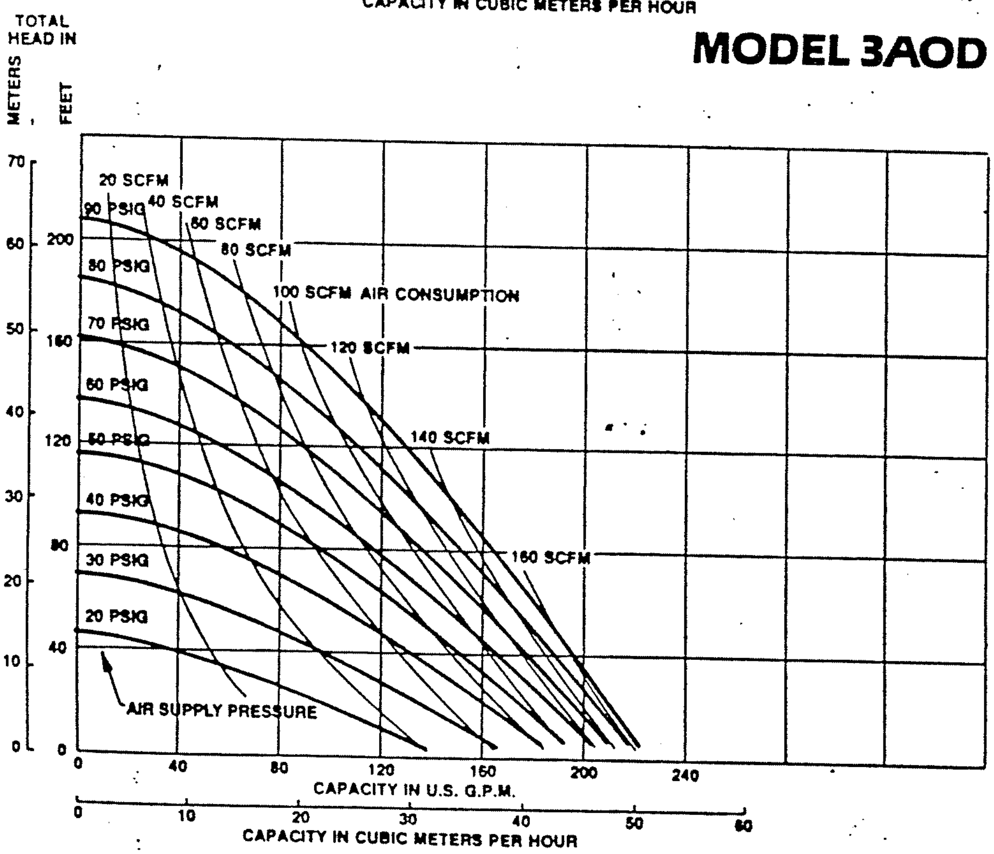
ITT Marlow
ITT Fluid Technology Corporation

P.O. Box 200 Midland Park, New Jersey 07432 USA • (201) 444-6900 • Telex 13-0486 • Fax (201) 444-3865
Warehouses in Houston, Texas and Costa Mesa, California
55 Royal Road, Guelph, Ontario N1H 1T1 Canada • 519-821-1900 • Telex 0695-6538
Western House, 2 Cambridge Rd, Stansted, Essex CM 24 8BU England • 001-44-279-812817 • Telex 817559

Performance Curves



2"



3"

Average Performance for all Metallurgies and all Elastomers including Teflon. (No derating of the performance is necessary for Teflon Fitted Pumps.)

CP-5

MOONEY PROCESS EQUIPMENT COMPANY

☐ 32700 W.8 MILE RD. FARMINGTON, MI.48024 (313) 476-7220 FAX (313) 476-7810

☐ 7777 WALL ST.-BOX 25437 CLEVELAND, OHIO 44125 (216) 524-9600 FAX (216) 524-2676

☒ 2235 KENMORE AVE. BUFFALO, N.Y. 14207 (716) 873-8185 FAX (716) 873-0768

☐ 11236 WILLIAMSON ROAD CINCINNATI, OHIO 45241 (513) 489-8805 FAX (513) 489-1642

FAX TRANSMITTAL

TO: GALSON & GALSON DATE: 8/31/88

ATTN: GARY HOBBS # PAGES: 1

FAX #:

MESSAGE: REF PUMP INQUIRY

G + H PUMP MODEL NBR. GHC-3/195 CENTRIFUGAL

316 STAINLESS STEEL – 4" INLET 3" OUTLET

CLAMP CONNECTIONS – 20 H.P. MOTOR @ 3600 RPM

480 VOLTS 3 PHASE 60 HZ

PRICE –

POLISHED $2690.00

NON-POLISHED $2580.00

DELIVERY – 4 WEEKS

BY: DICK ETZEL

QUOTATION

PAGE 1 OF 1

O·R·Lawrence co. INC.
PROCESS EQUIPMENT AND CONTROLS

ORL CO.

BUFFALO: 716-839-4422
SYRACUSE: 315-455-5587
ALBANY: 518-456-4444

MANUFACTURER'S AGENT SERVING INDUSTRY FOR OVER 35 YEARS

TO: GALSON & GALSON

ATTENTION: GARY HUBBS

REFERENCE: TELECOM 8-26
QUOTATION NO:
DATE: 8-26
BY: R. LAWRENCE

We are pleased to submit our quotation on the following:

ITEM	QUANTITY	DESCRIPTION	PRICE EACH
1	1	PULSAFEEDER PUMP MODEL 680C FOR 32 GPH OF 96% H2SO4 @ 100 psi	$1222.00
		MAX. 1/6 HP 1750 RPM	
2	1	½" BACK PRESSURE VALVE FOR 96% H2SO4	$ 453.00

TERMS AND CONDITIONS:

PAYMENT: NET 15
F.O.B.: S.P.
DELIVERY: 6 WEEKS
QUOTATION VALID FOR: 30 DAYS

PLEASE ADDRESS ORDERS TO:

O.R. LAWRENCE CO.
5858 E. MOLLOY RD.
PICKARD BLDG., ROOM 160
SYRACUSE, N.Y. 13211

Thank you for the opportunity of quoting to your requirements.

Shako, Incorporated

DP-2

Engineered Products

FAX COVER LETTER

Shako Inc.
6191 East Molloy Rd.
East Syracuse, NY 13057

Telephone : 315-437-1294

FAX: 315-437-0351

TO: GULSON & GULSON

Attention: GARY

Date: 8-30-88 TIME: 8:50 A.M.

Subject: ARO DIAPHRAGM PUMP TO HANDLE 200 GPM POT. HYDROXIDE HOT!
$4760.00 ea.

Pages (Including This Fax Cover Letter) 3

Please Reply ( )

No Reply Necessary (✓)

Signature David Baker

Comments:

Air-operated Double Diaphragm Pumps

ARO

3" Inlet and Outlet Ports

Variable Inlet and Outlet Positioning Enables Multiple Installation Options

The inlet and outlet manifolds are reversible. This allows the user to position the pump for the most effective installation.

Choose from Three Wetted-parts Materials

Aluminum
Cast Iron
Stainless Steel

Select from Five Diaphragm Materials

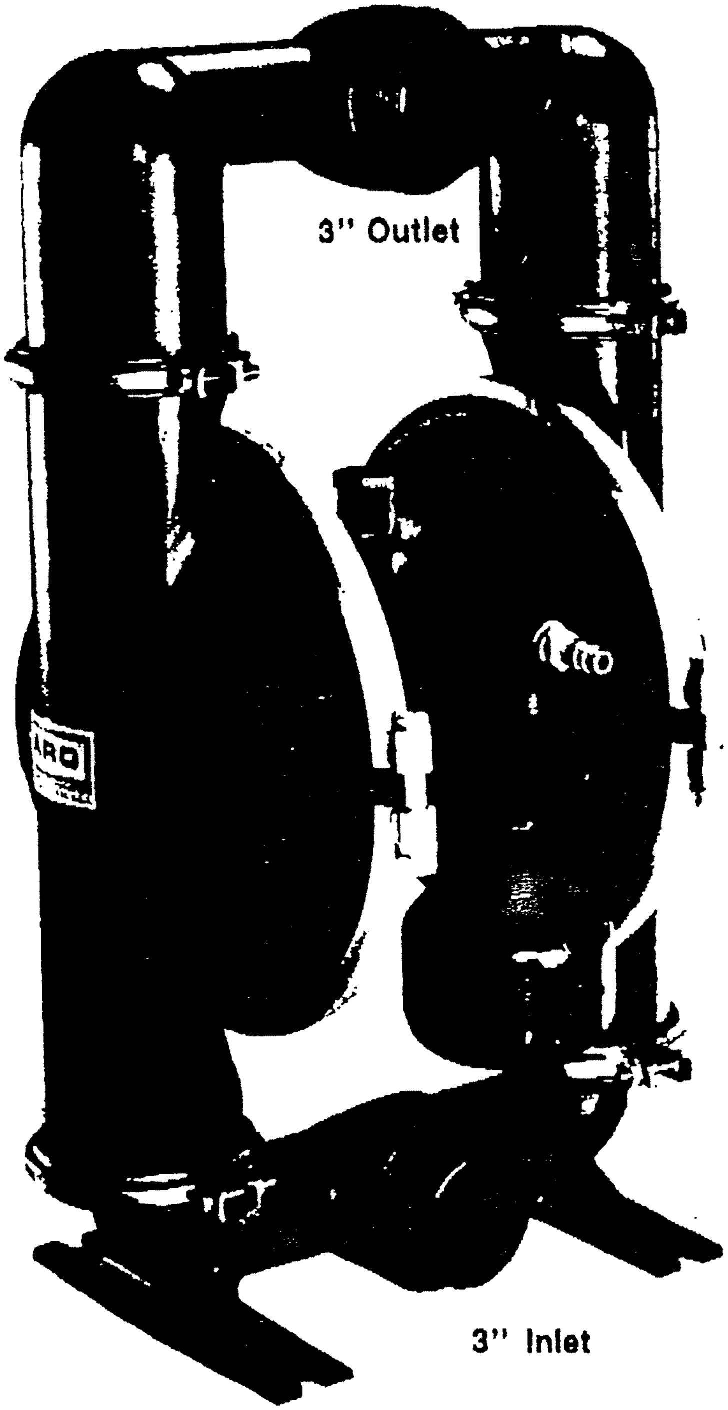
Neoprene
Buna-N
Viton
EPR
Teflon

Your Choice of Six Seat Materials

Neoprene
Buna-N
Viton
EPR
Urethane
Stainless Steel

Self-Contained Oiler Assures Proper Lubrication

Lubrication for the air valve is provided by the integral oiler that holds up to one quart of lubricant.



Air Filter Screen is Easily Removed

Removing the plug on the front of the air valve section accesses the filter screen. This screen traps any impurities that may exist in the air lines before they enter the pump.

The Air Valve Section Is Easily Removed

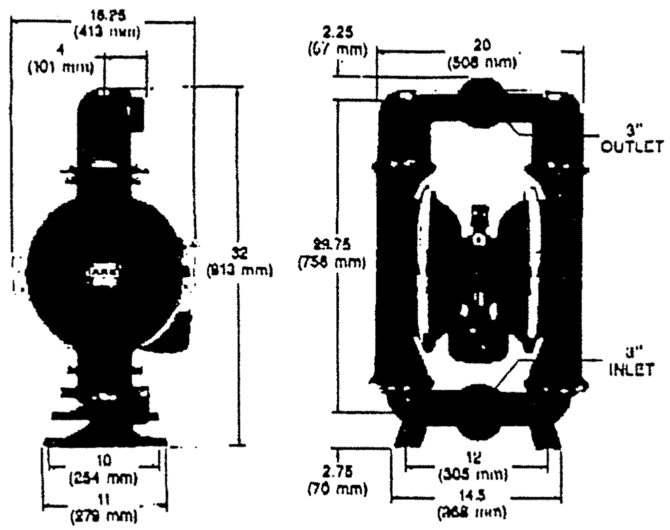
Separate access to the main air valve allows the user to perform maintenance or inspection without disturbing the fluid section of the pump.

Split Band Design Allows Easy Assembly / Disassembly

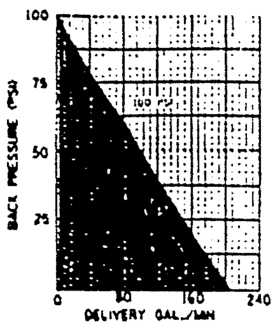
By removing four band clamps the pump can be separated from the permanent piping for service. Remove the two large band clamps and the diaphragms can be inspected or replaced. This can save maintenance, inspection, and repair time.

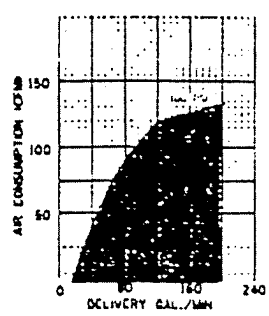
205 GPM Delivery Capacity

Dimensions



Performance Data





SPECIFICATIONS

BSP Thread Models	NPT Thread Models	Seat Construction	Ball Construction	Diaphragm & O-Ring Construction	Ratio	Maximum Gallons (litres) Per Minute	Air Inlet NPT	Fluid Inlet Inches	Fluid Outlet Inches	Maximum Operating Pressure PSI (bar)	Suspended Solids Maximum Diameter Inches(mm)	Weight Lbs. (kg)
Aluminum Wetted Parts-Single Inlet/Single Outlet												
[illegible]	666300-A11	Neoprene	Neoprene	Neoprene	1:1	205 (776)	1/2(F)	3(M)	3(M)	120 (8.3)	3/8 (9.5)	122 (55)
[illegible]	666300-B22	Buna-N	Buna-N	Buna-N	1:1	205 (776)	1/2(F)	3(M)	3(M)	120 (8.3)	3/8 (9.5)	122 (55)
[illegible]	666300-C43	Viton	Teflon	Viton	1:1	205 (776)	1/2(F)	3(M)	3(M)	120 (8.3)	3/8 (9.5)	122 (55)
[illegible]	666300-E55	EPR	EPR	EPR	1:1	205 (776)	1/2(F)	3(M)	3(M)	120 (8.3)	3/8 (9.5)	122 (55)
[illegible]	666300-F81	Polyurethane	Polyurethane	Neoprene	1:1	205 (776)	1/2(F)	3(M)	3(M)	120 (8.3)	3/8 (9.5)	122 (55)
[illegible]	650724	Neoprene	Neoprene	Neoprene	1:1	205 (776)	1/2(F)	Screened	3(M)	120 (8.3)	3/8 (9.5)	132 (60)
[illegible]	650725	Buna-N	Buna-N	Buna-N	1:1	205 (776)	1/2(F)	Screened	3(M)	120 (8.3)	3/8 (9.5)	132 (60)
Cast Iron Wetted Parts-Single Inlet/Single Outlet												
[illegible]	666302-A11	Neoprene	Neoprene	Neoprene	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	190 (86)
[illegible]	666302-B22	Buna-N	Buna-N	Buna-N	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	190 (86)
[illegible]	666302-C43	Viton	Teflon	Viton	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	190 (86)
[illegible]	666302-E55	EPR	EPR	EPR	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	190 (86)
666322-F81	666302-F81	Polyurethane	Polyurethane	Neoprene	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	190 (86)
666322-244	666302-244	Stainless	Teflon	Teflon	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	190 (86)
Stainless Steel Wetted Parts — Single Inlet/Single Outlet												
666321-A11	666301-A11	Neoprene	Neoprene	Neoprene	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	210 (95)
666321-B22	666301-B22	Buna-N	Buna-N	Buna-N	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	210 (95)
666321-C43	666301-C43	Viton	Teflon	Viton	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	210 (95)
666321-E55	666301-E55	EPR	EPR	EPR	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	210 (95)
666321-F81	666301-F81	Polyurethane	Polyurethane	Neoprene	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	210 (95)
→ 666321-244	666301-244	Stainless	Teflon	Teflon	1:1	205 (776)	1/2(F)	3(F)	3(F)	120 (8.3)	3/8 (9.5)	210 (95)

Note: Air motor muffler is not included with pump. Order 93354-1 MUFFLER separately.
Muffler installation requires a 1" NPTF 45° St. Elbow to be purchased separately.

Non-wetted parts on all pumps are aluminum and brass.

Warning: Aluminum is not compatible with Halogenated Hydrocarbon Solvents.

FLUID HANDLING EQUIPMENT
THE ARO CORPORATION
ONE ARO CENTER, BRYAN, OHIO 43506-0151
PH 419-636-4242 • TWX 810-443-3994 • TELEX 286458 • FAX 419-636-2115

Production Benefits

The Advantage of Air-Operation

No Electrical Spark
Since ARO Diaphragm Pumps operate on compressed air, there is no danger of an electrical spark or any need for expensive explosion proof motors.

Pollution-Free Operation--No Exhaust Fumes
ARO Diaphragm Pumps exhaust clean, slightly-chilled air, not potentially dangerous carbon monoxide.

Cannot Overheat
Since there are no heat generating electrical components, your ARO Diaphragm Pump stays cooler. If you are pumping solvent-based fluids, this means reduced solvent flash off.

On-Demand Performance and 100% Energy Efficiency
When you close the fluid outlet of an Aro Diaphragm Pump, the pump stops. No movement, no wear, no overload, no heat build-up, and no power consumption. When the dispensing line is re-opened, the flow resumes, with power consumption in direct relation to fluid delivery. No power is ever wasted.

The Advantage of Diaphragm Pumps

Variable Delivery Rate
The flow is variable from 0-205 GPM. Simply adjust the inlet air pressue from 0-120 PSI to achieve the desired flow.

Abrasion Resistant Design
The fluid section of an ARO Diaphragm Pump has no packings, close-fitting, rotating, or sliding parts.This allows the pump to handle abrasive fluids and suspended particles up to 3/8 inch in diameter.

No Foaming of Material
The twin diaphragm design results in gentle handling of your material. There are no gears, impellers or blades to shear or foam your fluids.

Longer Service Life
Minimum moving parts exposed to fluid means greatly increased service life and minimum maintenance and downtime.

Hassle-Free Maintenance
Separate access to the main air-valve allows you to perform maintenance without disturbing the fluid section.

Runs Dry Without Damage
Since there are no close fitting or sliding parts in the fluid section, the pump can run dry, indefinitely, without damage.

The Advantage of the ARO 3" Diaphragm Pump

Pumping Efficiency Remains Constant
Since the ARO Diaphragm Pump contains no rotors, gears, vanes, pistons, impellers, cams, or tubes, there is no gradual decline in performance due to wear of close-fitting, mechanical parts.

Positive Priming Provides Fast, Easy Start-Ups
The check-valves are close to the diaphragm to insure positive self-priming even from a dry start.

Pump Fluids with Suspended Solids Content up to 3/8" in Diameter.
The fluid section has no packings, close-fitting or sliding parts. This allows the pump to handle fluids with suspended solids content up to 3/8" in diameter.

High Volume Delivery
This pump has one of the highest delivery rates in its class. It is capable of delivering up to 205 gallons per minute. This flow rate is capable of supplying several dispensing points simultaneously.

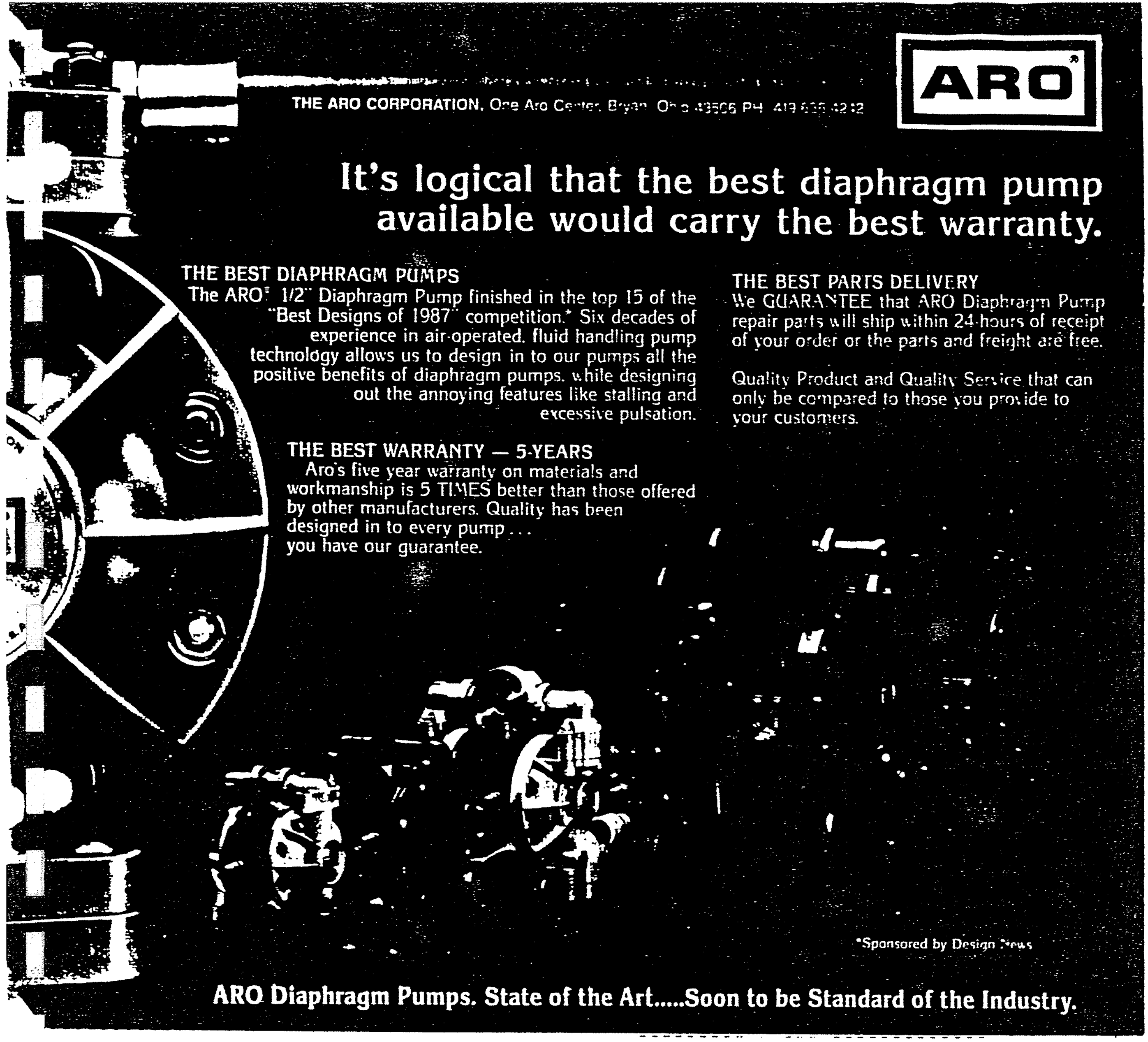
Screened Inlet Design Is Excellent for Dewatering Applications

This adaptation of the pump has been specifically designed to meet the needs of plant operations, municipalities, building contractors and other installations that require evacuation of large volumes of water from low-lying, flooded or water collection areas.

Screen Out Large Particles

The screened inlet assures maximum delivery potential without the worry of inlet plugging or ingesting large particles.

NOTE: When the inspection cover is removed the standard inlet is exposed and is available for conventional piping.



For more information on the complete line of ARO Diaphragm Pumps, please complete this card and drop it in the mail.

NAME ______________________

TITLE ______________________

COMPANY ______________________

STREET ______________________

CITY __________ STATE ______ ZIP ______

PHONE ______________________
(AREA CODE)

What do you manufacture? ______________

- ☐ Please have a representative call for an appointment.
- ☐ Please send literature. I would like to know more about:
- ☐ **Diaphragm Pumps**
  - ☐ **Metallic**
    - ☐ Aluminum
    - ☐ Stainless Steel
    - ☐ Cast Iron
  - ☐ **Non-Metallic**
    - ☐ Polypropylene
    - ☐ PVDF (Kynar®)
  - ☐ **Delivery Requirements**
    - ☐ 0-14 GPM
    - ☐ 0-45 GPM
    - ☐ 0-90 GPM
    - ☐ 0-150 GPM
    - ☐ 0-240 GPM
- ☐ Spray Coating Systems
- ☐ Extrusion Systems
- ☐ Lubrication Systems
  - ☐ Portable
  - ☐ Centralized
- ☐ Transfer Pumps—Piston Style
  - ☐ High-pressure
  - ☐ Low-pressure

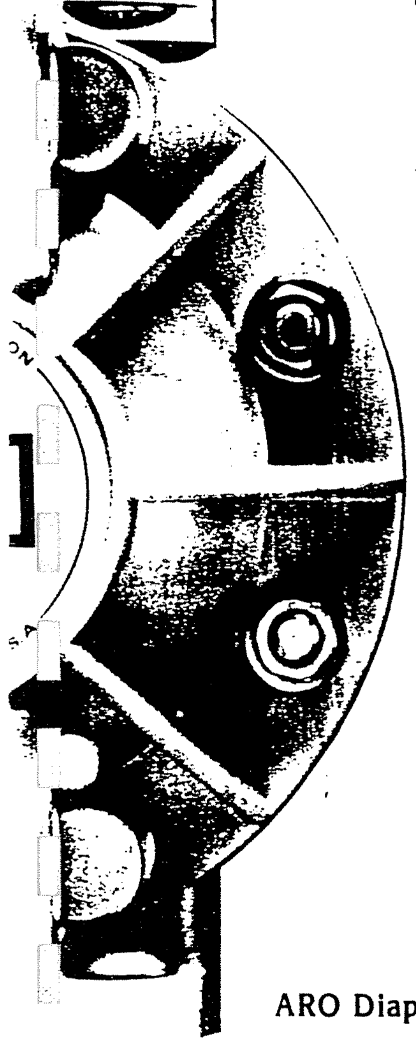
ARO
FLUID HANDLING EQUIPMENT
THE ARO CORPORATION
ONE ARO CENTER, BRYAN, OHIO 43506-0151
PH 419-636-4242 • TWX 810-443-2994 • TELEX 286456 • FAX 419-636-2115

8892-P

THE ARO CORPORATION, One Aro Center, Bryan, Ohio 43506 PH: 419-636-4242

ARO

The logical choice for diaphragm pumps is ARO.



No Oiling of the Air Valve is Ever Required
The two-stage, air-operated, pilot valve that controls the reciprocating motion of the pump does not require oiling. Unlike other pumps, the ARO® Diaphragm Pump leaves its environment just as it was — no atomized oil droplets to contaminate your atmosphere or your product.

A Unique Air Control Design Keeps You in Operation
The pilot-assisted, power valve used in this pump is design-perfected and performance proven to be "no stall." You can operate the ARO Diaphragm Pump at very low air-inlet pressure or use it with heavy viscosity materials without the loss of production caused by a stalled pump.

Abrasion-Resistant Design
The fluid section of the ARO Diaphragm Pump has no packings, close fitting, rotating or sliding parts. This allows the pump to handle abrasive fluids, fibers and suspended semi-solids up to 1-1/2" in diameter.

No Foaming or Shearing of Material
The twin-diaphragm design results in gentle handling of material. There are no gears, impellers or blades to shear or foam your material.

No Electrical Spark
Since ARO Diaphragm Pumps operate on compressed air, there is no danger of an electrical spark or any need for expensive explosion-proof motors or enclosures.

On-Demand Performance and 100% Energy Efficiency
When you close the fluid outlet of an ARO Diaphragm Pump, the pump stops. no movement, no wear, no overload, no head build-up and no power consumption — 100% energy efficient.

Variable Flow Rate
The flow rate is variable from 0 to 205 GPM. Simply adjust the inlet air pressure from 0—120 PSI to achieve the desired flow rate.

Runs Dry Without Damage
Since there are no close-fitting or sliding parts in the fluid section, the pump can run dry, indefinitely, without damage.

Positive Priming Provides Easy Start-Ups
The check valves are located close to the fluid chambers to assure positive self-priming.

Pumping Effiency Remains Constant
Since the ARO Diaphragm Pump contains no rotors, gears, vanes, pistons, impellers, cams or tubes, there is no gradual decline in performance due to wear of close-fitting mechanical parts.

ARO Diaphragm Pumps. State of the Art.....Soon to be Standard of the Industry.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO 27 BRYAN, OHIO

POSTAGE WILL BE PAID BY ADDRESSEE

THE ARO CORPORATION
ONE ARO CENTER
BRYAN, OHIO 43506-9988

August 26, 1988

Gary Hobbs
Jackson & Jackson

Per our phone conversation of August 21, 1988 please find requested information on pumps:

Pumps: 4BHK-F
3x2 Suction & Discharge
10hp 3600 rpm
5¼" impeller

You would need to specify end connections for the actual order.

Total Price - $1,236.00 - (1936.00) this price will increase as the year progresses; I will notify you of all price increases as they occur.

If I can be of any assistance, please contact me.

Sandy Fletcher

Gary

Galson & Galson P.C.

Consulting Engineers
Syracuse • Rochester

6601 Kirkville Road
E. Syracuse, N.Y. 13057
Tel: (315) 437-7181

September 12, 1988

Sanitary Processing Equipment Corp.
2623 Lodi St.,
Syracuse, N. Y. 13208

Attn: Robert Feldmier

Re: Request for Quotation on Two Sets of Tanks on Two Identical Trailers
G&G Project 88-046

Gentlemen:

Enclosed you will find information required for you to provide us with a quotation on tanks. These tanks will be completely cleaned and empty during transport so no special bracing or support will be needed.

Also enclosed is a conceptual drawing of the tank trailers.

We are in need of a budget quotation for these tanks.

Some minor changes to the spec's on the drawing are:

1. Tank separations can be something less than 1/4".
2. Pressure rating is atmospheric.
3. Insulation jacket should be 316 S.S. w/2" fiber glass insulation.
4. 16" Ø manway acceptable.
5. Teflon seals are preferred, but Kalrez or Graphoil are acceptable.
6. We will have trailers designed and built.

Tri-Clover or Cherry-Burrell types of ferrules are required for the connections.

Please submit your quotation as soon as possible. Please call if you have any questions. Thank you.

Very truly yours,

GALSON & GALSON

Gary Hobbs

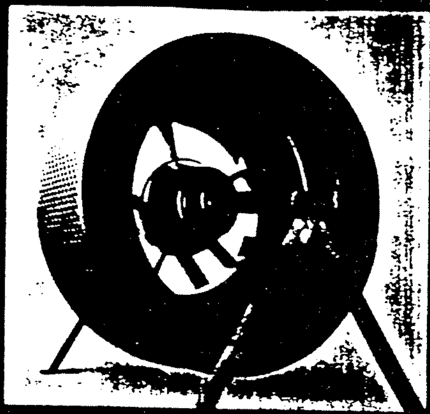
Gary Hobbs

GH:rb
Enclosure

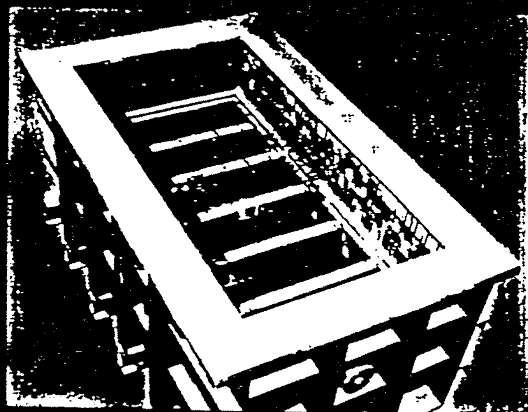
BULLETIN G - 1984

CORROSION RESISTANT

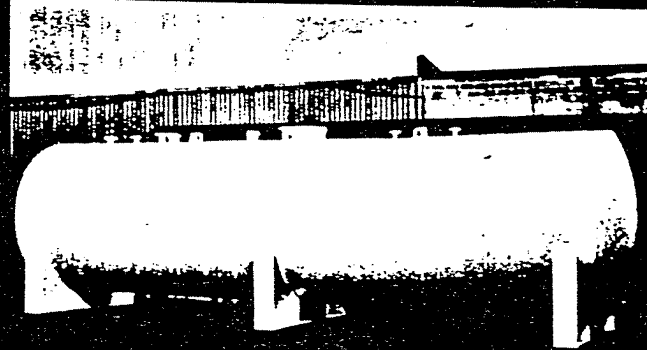
LININGS
PLASTIC FABRICATIONS
COATINGS
ACID-PROOF BRICK INSTALLATIONS
CEMENTS
FLOOR TOPPINGS



EL-CHEM KYNAR coated centrifuge basket.

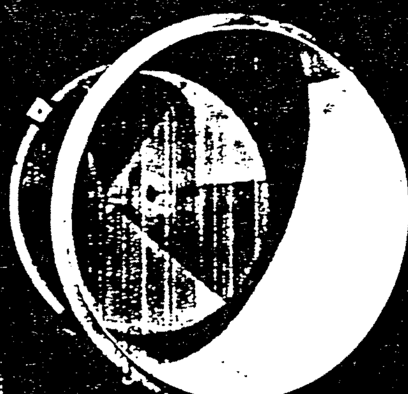


Acid-proof brick lined tank.



EL-CHEM POLY-PLY lined horizontal storage tank

EL-CHEM KYNAR coated casing assembly.



Loose polypropylene liner in steel tank.

SABUR TECHNOLOGIES, INC.
P.O. Box 23137 • Rochester, NY 14692
Rochester (716) 654-8320
Buffalo (716) 692-4450
Albany (518) 482-0092

ELectro CHEMical

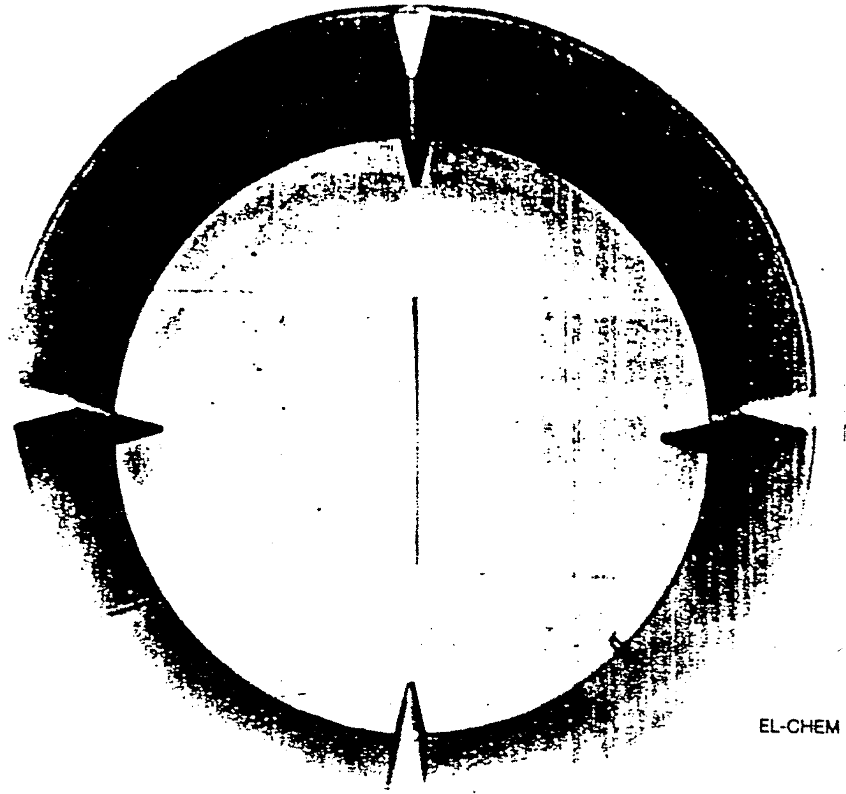
ENGINEERING & MFG. CO.

CORROSION SPECIALISTS

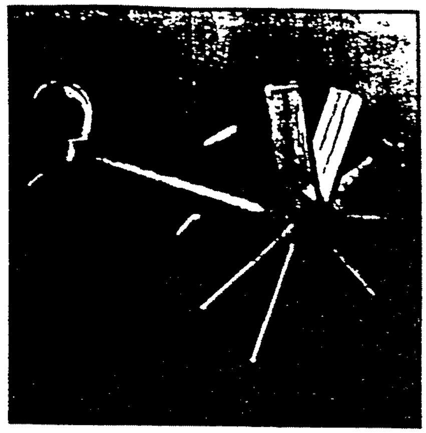
750 BROAD STREET, P.O. BOX 509, EMMAUS, PA 18049-0399

215-965-9061

LININGS



EL-CHEM POLY-PLY lined tank.



EL-CHEM DURO-BOND SH-160 lined agitator.

EL-CH

ELECTRO CHEMICAL furnishes and applies a complete line of natural rubber, synthetic rubber and resin lining materials. This permits us to offer the best and the most economical lining for your particular process. If acid-proof brick protection is required, we are in a position to install the complete job with undivided responsibility.

■ **EL-CHEM CHLORO-BOND G** - An uncured chlorobutyl elastomer applied in sheet form and vulcanized after application using exhaust steam.

■ **EL-CHEM DURO-BOND E-CTFE** - A laminated sheet lining consisting of a layer of E-CTFE HALAR* resin laminated to a knit glass or vulcanized soft rubber backing.

■ **EL-CHEM DURO-BOND FEP** - A laminated sheet lining consisting of a layer of FEP TEFLON+ laminated to a knit glass backing.

■ **EL-CHEM DURO-BOND PVDF** - A laminated sheet consisting of a layer of polyvinylidene fluoride resin laminated onto a layer of knit glass or vulcanized soft rubber backing.

■ **EL-CHEM DURO-BOND NRL** - A seamless natural rubber latex lining always used in conjunction with an acid-proof brick sheathing.

■ **EL-CHEM DURO-BOND S-103** - A soft natural rubber lining applied in sheet form and vulcanized by exhaust steam after application. It is formulated for maximum service as a corrosion resistant tank lining together with good abrasion resistance.

■ **EL-CHEM DURO-BOND S-123** - An uncured high grade, three ply rubber applied in sheet form and vulcanized after application using exhaust steam. The sheet consists of a soft inner ply which is bonded to the steel fo maximum adhesion, a semi-hard center ply for maximum chemical resistance and a soft natural outer ply for maximum abrasion resistance.

■ **EL-CHEM DURO-BOND SH-160** - An uncured rubber lining applied in sheet form, vulcanized after application using exhaust steam. The lining consists of a flexible ebonite semi-hard rubber layer backed with a thin layer of soft gu rubber for bonding to the substrate

■ **EL-CHEM DURO-BOND SH-160CL** - An uncured flexible hard rubber sheet lining vulcanizec after application and compounded especially for chlorine service.

■ **EL-CHEM DURO-BOND TT**- A laminated sheet comprised of a center layer of cured natural rubber and two outer layers of semi-cured chloroprene polymer The outer layers chemically cure when activated by the bonding cement. This material is excellent for repairing other rubber and elastomeric linings.

■ **EL-CHEM DURO-LON S-165** - An uncured Hypalon+ sheet lining vulcanized after application by using hot air. It has excellent resistance to abrasion, o and chemical agents.

■ **EL-CHEM DURO-LON SC-175** - A precured Hypalon sheet lining having excellent abrasion and corrosion resistant properties. It is used when hot air curing is not practical.

*TM of Allied C
+TM of DuPont C
†TM of Pennwalt Corporatio

FELDMEIER Triple-Tube AND Tanks

SANITARY PROCESSING EQUIPMENT CORPORATION

FACTORY: 2611 LODI STREET, SYRACUSE, NEW YORK 13208 • (315) 424-1904
MAILING ADDRESS: P.O. BOX 178, SALINA STATION, SYRACUSE, NEW YORK 13208

RECEIVED
SEP 23 1988
GALSON COMPANIES

September 22, 1988

GALSON & GALSON P.C.
6601 Kirkville Road
E. Syracuse, New York 13057

Attn: Gary Hobbs

Dear Gary:

This letter is to confirm the budget price that I gave you over the phone for the compartmentalized tanks.

Net Price Each: $48,000.00

All material is to be Type 316 with a standard mill finish. All welds are to have discoloration removed. All connections will be clamp style.

When you have all your specifications finalized we'd be happy to submit a firm quotation.

Thank you for the oppportunity of furnishing a proposal and we look forward to working with you.

Yours truly,

Robert E. Feldmeier Jr.

REF/lc

9/16/88

TO: SANDY
ED JOY CO.

		BUDGET NET PRICE
ITEM 1	(1) 2,000 GAL. 'GH' 84" ID X 105" LONG	$ 9,250.-/VESSEL
ITEM 2	(1) 4000 GAL 'GH' 96" ID X 153" LONG	$ 10,700.-/VESSEL
ITEM 3	(1) 200 GAL HORIZ. INSULATED.	NO - BID
ITEM 4	(1) 6,000 GAL. 'GR'	$24,600./VESSEL
ITEM 5	(1) 2,000 GAL. 'GR'	$ 18,000 /VESSEL
ITEM 6	(1) 1,500 GAL. 'GR'	$ 17,000/VESSEL.
ITEM 7	———	NO-BID

CHERRY-BURRELL
AMCA
INTERNATIONAL
CHERRY-BURRELL CORPORATION
575 EAST MILL STREET
P.O. BOX 1028
LITTLE FALLS, NY 13365-1028

SABUR TECHNOLOGIES, INC.

P.O. Box 23137, Rochester, NY 14692

FAX TRANSMITTAL

DATE: 10-1-88

FROM: Larry Stephans SABUR

TO: Gary Hobbs Galson & Galson

PAGES: 1 (INCLUDING COVER SHEET) FAX 315-437-0509

COMMENTS: PCB PROJECT

SULFURIC ACID TANKS - BUDGET PRICE

(2) 2'6" Ø X 7'3" LONG CARBON STEEL TANKS

HORIZONTAL WITH F&D HEADS

TANK (ASME CODE CONST, NO STAMP) $3500 ea

25 MIL KYNAR PVDF LINING $2400 ea

EXTERIOR EPOXY PAINT 250 ea

TOTAL $6,150 ea. tank

SUPPLIER ELECTED CHEMICAL ENGR.

If you have any questions, please call

1-800-62 SABUR

(627-2287)

Larry Stephans

FAX # 716-654-7884

Rochester 716-654-8320 Buffalo 716-692-4450

125

Appendix 2 - Daily notes on pilot plant operation

WIDE BEACH PILOT TEST CHRONOLOGY/DIARY

Site personnel initials: Robert Peterson - RLP, Roger Gall - RG, Tim Geraets - TG, Edwina Milicic - EM, Jim Roeder - JR

04/01 - 05/12/88 - Preparations in Syracuse for Wide Beach Pilot Test included:

1. delivery and wiring of the Littleford DVT-130 Polyphase reactor
2. experimenting with generator requirements
3. solving several wiring problems with the 10 hp reactor motor
4. experiments with the steam generator, swapping the initial rental unit for a much larger model
5. setting up the company pickup truck for towing the Mobile Lab
6. fabricating power cords for the Mobile Lab
7. attempts to test replacement steam generator (not successful because of insufficient electrical generator capacity).
8. many other logistical details.

05/13/88 - Transported Mobile Analytical Lab to site. 250KW diesel-powered generator and fuel tank delivered, fuel delivered. Niagara Mohawk installed line power drop (208VAC, 1-ph). Purchased electrical service box.

05/14/88 - Installed electrical service for Mobile Lab and receptacles around the site. Set up Mobile Lab.

05/15/88 - Set up operator quarters.

05/16/88 - Front end panel fell off tent overnight, a 30'X60' woven polyethylene tarp was ordered from Northern Hydraulics for replacement.

Unpacked Pilot Plant trailer, unpacked U-Haul trailer and stored PPE (personal protective equipment), unpacked compressed gases and secured them against the frame of the tent. Telephone installed. Continued Mobile Lab set up.

Began construction of a sound enclosure for the diesel generator. Initial sound enclosure was inadequate. Supplies were purchased to upgrade the structure. Plan: use CDX plywood and fiberglass, then cover with poly sheeting to protect from moisture.

05/17/88 - Built revised and improved sound enclosure. Staged reagent and soil drums in working locations. Built process dike. Grounded diesel generator and fuel tank, grounded Pilot Plant trailer to same ground rod. Tested generator- to-Pilot Plant hookup. Bumped and checked rotation of pumps and motors in Pilot Plant. Installed new "heaters" in Littleford electrical control box. Tested steam generator - seemed OK. Continued Mobile Lab set up.

05/18/88 - Continued unpacking Pilot Plant. Leak tested reactor airlines. Videotaped a simulation of loading soil and reagents into Littleford reactor.

Repeated heat up test of reactor. Steam generator worked well for about one hour, then pressure fell from 90 to 40 psig. Finished Mobile Lab set up.

05/19/88 -Installed sampling port, temperature sensors, reagent loading port and condensate system on Littleford reactor. Redid videotape of reagent loading, videotaped sampling and filtering operations. Added more electrolyte to steam generator: it didn't help. Cut new end panel for tent, rented scaffold for installing it, and installed the panel. Scaffold ready to return to vendor by end of work day.

05/20/88 - Set up ambient air monitoring equipment, pumps and stations. Meteorological station readout would not function in tear-off mode.

05/21/88 - Started ambient air monitoring program on site perimeter fence. Grass cut on site and at nearby rental cabin. Hooked up 12V switch to electric water pump in Mobile Lab.

05/22/88 - Changed ambient air monitors. Set up for public demonstration (brochures, TV for videotape, signs for site tour). Testing revealed that the steam generator is capable of high (>100 psig) pressure if the pressure regulator is adjusted with a wrench. Testing also revealed that PEG was leaking from the mechanical seal in Littleford reactor. We were Unable to keep pressure on mechanical seal, the air source ran out, PEG reservoir (seal pot) emptied into "somewhere." Testing began with 100 psi, but in less than one hour the pressure was at 0, and the seal pot was half empty. Could be major problem/delay. Also needed more information from Littleford on Filtorr™ system.

Conducted demonstration for Wide Beach residents. Demo well attended by families, representatives from local press and local government.

05/23/88 - Changed ambient air monitors. Erected sinks, built dike for decontamination (decon) area, set up skids for undressing area in decon line, filled water drums for decon.

Tested Littleford reactor by pressurizing mechanical seal system, and closing reactor vent line. Pressure stabilizes at 20 psi in mechanical seal pot and reactor. Leak is obviously in mechanical seal. Called Littleford Bros and explained problem. Littleford called back to inform us that Bill Webber would be here late Tuesday, 05/24/88, and to ask directions to site.

Conducted demonstration for Wide Beach residents, possible clients, Ebasco, NYSDEC and EPA personnel. Decided not to empty reactor till demo was finished at 1615 (4:15 PM).

05/24/88 - Changed ambient air monitors. Set up for site-specific training for Ebasco, NYSDEC and EPA personnel. Conducted training for the above people 0830 - 1000, including dress-out demo, question and answer period.

Met with Herb King (EPA) and Joe Cleary (Ebasco) to discuss comments on Health & Safety plan, agreed on changes to be made and submitted to Ebasco/EPA.

Conducted demonstration for prospective clients and trainees.

Weighed out water washes, staged drums in diked area for first run. Mixed 400 lb. of 1:1:2 (PEG:TMH:DMSO) and cleaned out condensate drums. Emptied Littleford reactor and attempted to pull mixer blades off shaft. Unable to remove mixer blades. Littleford informed us that Bill Webber wouldn't arrive till 05/25/88, and that he would bring a replacement mechanical seal with him. Webber would want to examine old seal to determine cause of failure. We also planned to ask him about Filtorr and removing mixer blades.

05/25/88 - Changed ambient air monitors. New end panel was flapping badly in the wind, so we cut one end loose to ease tension. Removed Littleford mixer blades with much hammering and the assistance of the 1-ton cable come-along. Bill Webber to be here around lunch time. Weighed and staged all drums for first soil run.

Worked on finalizing Health & Safety (H&S) Plan changes. Talked, by phone, with Herb King and Rod Turpin of the EPA about H&S Plan changes. Made final changes to H&S Plan, addressing requested changes in emergency phone numbers, confined space entry and respiratory protection.

Changed mechanical seal in Littleford reactor with assistance of Bill Webber. Discovered cracked seal faces in old seal. Bill was unable to explain crack in seal, says it just happens sometimes. Reassembled reactor, discovered a need for more Teflon O-rings to seal end of shaft sleeve, (to be picked up in Syracuse). KalRez seals in mechanical seal seemed to be in good condition, no problems with reagents.

05/26/88 - Changed ambient air monitors. Checked site before leaving for the Holiday weekend.

05/27/88 - No work on site.

05/28/88 - Checked site, picked up supplies for calculating air monitoring data. Repaired meteorological station.

05/29/88 - Checked site and picked up meteorological data. Began reducing data.

05/30/88 - Checked site. Finished checking, reducing and filing meteorological data.

05/31/88 - Changed ambient air monitors. Prepared process area for loading contaminated soil. Hung GRC sign on front gate. Charged portable eye wash/shower units. Loaded reactor with 200.0 lb of "low PCB" soil, from Drum

#2 in preparation for first reaction, 06/01/88. Mixed soil in reactor and took starting soil sample for analysis.

06/01/88 - (RXN #1) Began heating steam generator at 0930, began agitating reactor at 0932. Amperage draw on reactor with just soil was 12 amps, with soil/reagent slurry, 8 amps. Reactor turning at 50 RPM. Loaded reagents into reactor, 86.0 lb 1:1:2, 41 lb KOH (aqueous 45%). Finished boiling off water from soil and KOH by 1200. Total weight of condensate in collection drum: 57.0 lb. PCB concentration reduced to <2 ppm by 1200. Introduced 20 psig nitrogen to reactor, allowed it to sit overnight to check integrity of seals.

Experienced problems with steam generator, not getting water for the boiler from the condensate return tank. Checked pump, seemed OK, checked valve, seemed OK. Ordered another pump from Electric Steam Generator in case of pump failure. Mechanical seal ran at >200° F. Just before shutting down reactor, a large rock or other solid material was caught under mixer plows, and the entire shaft and gearbox oscillated slightly, and generated lots of noise. Amp draw goes to 20-25. Rock finally dislodged, or broke and the amp draw returned to approx 9 amps. Reactor shut down at 1605.

An anomalous "70" peak appeared in the chromatograms while analyzing this run. We had encountered this peak when treating other soils in the laboratory, and found that it was elemental sulphur. The sulfur peak caused false high PCB results, particularly when the PCB concentration was <5 ppm. Cleaning acid-washed sample extracts with metallic copper removed sulfur without removing any PCB. We decided to use the copper-cleaning step in all subsequent analyses. Confirming samples taken at 1300 and 1400 showed concentrations <2 ppm, even when the 70 peak was included. (Further confirmation of <2 ppm came from GC/MS analysis done on 06/22/88.)

06/02/88 - Changed ambient air monitors. Changed plumbing for vacuum side of Filtorr™. We were still waiting for instructions from Littleford on the use of the Filtorr™. Pressure on reactor was 0 psig. It had been set at 20 psig before leaving the site on 6/1/88.

Sampled the condensate drum: it was a very smelly (rotten cabbage) single-phase liquid. Mixed the reactor contents for 5 minutes before removing a slurry sample for centrifuge experiments. Total slurry removed was 8.5 lb. Took reagent sample: 5.0 lb. Set up for filtering/washing trials with Filtorr™.

Filtorr trials at atmospheric pressure not at all successful. Attempted using Filtorr under nitrogen pressure as high as 100 psig, with no results. The bottom plug did begin to leak however, so we attempted to force the reagent around the edges of the bottom plug by releasing pressure on the closing ram and introducing 10 psig nitrogen to the reactor chamber. It filtered satisfactorily for approximately 5 minutes then began blowing nitrogen through the filter cake. Reagent recovery using this unorthodox method was 83.5 lb. 121.5 lb of Wash #1 was pumped in and agitated for 30 min. Total recovery of Wash #1 is 182.5 lb. 126.0 lb of Wash #2 was then pumped in and agitated for 30 min. The reactor was again pressurized to 10 psig. With pressure still on the reactor, the dump handle was accidentally bumped and the reactor emptied precipitously, scattering the contents all over the inside of the Pilot Plant trailer. The mess was cleaned up and collected in a waste drum, and the interior of the Pilot Plant was washed down.

After cleaning the trailer, the end panel was pulled off the reactor. A sizable quantity of material is stuck to the sides of the chamber, appears to be "rocked-up" KOH, or burnt PEG. Difficult to say if the "rock" was a result of too high a temperature, or because that part of the wall isn't completely swept by the plows. We filled the reactor half full of water and agitated for 30 min.

Pulled the feed pump for the steam generator and discovered it was not pumping at all. Hoped that the new pump would arrive on 06/03/88.

<u>06/03/88</u> - Changed ambient air monitors. Cleaned out the inside of the reactor, removed the Filtorr and replaced with a specially-fitted plug. Fitted the bottom plug with screens to enhance filtering. Loaded the reactor with 200.0 lb of soil from Drum #1, "high-PCB." Collected samples from final soil, reaction #1 and condensate drum.

<u>06/04/88</u> - Changed ambient air monitors. Conducted pressure test on reactor and discovered a leak in the bottom plug. We had replaced a 0.25" pipe plug with a pipe nipple for holding screens in place on the inside surface of the plug. This arrangement allowed the leak. We also suspected the integrity of the O-ring on the plug replacing the Filtorr assembly. Decided to pull that too. Had to empty soil to reach those pieces. Pulled end panel and cleaned out soil.

Replaced fittings in bottom plug of reactor. Replacing O-ring on Filtorr plug a was challenging. The O-ring had to be stretched excessively to fit over the plug, then heated with a torch to shrink-fit back on the plug. We broke a bolt in the plug body when replacing it in the reactor. Purchased a tap and screw puller to remove it. Tap broke off in the hole too. Planned to try it with 3 bolts. If it held pressure we would run with it as was. Tested reactor with 50 psig, plug held without evident leaking when soap tested. Reloaded the soil in the reactor.

During the work on the reactor we discovered that the soil in the reactor is only 18 ppm PCB. Take another sample, and found it to contain only 22 ppm.

Conferred with Joe Cleary of Ebasco, about Low PCB concentration of Drum #1. It was decided that we would analyze a composite sample of drums #3-10. If the composite >50 ppm we would reload with another drum.

<u>06/05/88</u> - Changed ambient air monitors. Pulled samples from Drums # 3-10 for composite sample. Analysis of composite: 75 ppm. Emptied reactor of soil from Drum #1 and reloaded with soil from Drum #10. Planned to dump the leftover portions of other drums into drum #10 as reactions progressed to make up enough soil for Reaction #10 (Recycle #8).

Mixed soil from Drum #10 for 15 min and pulled another sample.

Wind had done considerable damage to the new end panel: ripped it in several places. Attempted repairs with copious applications of duct tape.

Consultant brought in to maximize favorable orientation of intangible influences.

06/06/88 - (RXN #2) Changed ambient air monitors. Loaded reagents into reactor for Reaction #2. Started reactor and steam generator at 0820, opened steam to reactor at 0835. Reactor RPM at 50. When valve was opened on steam generator, pressure fell to 10 psig. Much adjustment required before steam generator produced usable, stable pressure. It took about 30 min. for the unit to produce good pressure. Pressure at 95 psig at 0915. Reactor began condensing water through air-cooled condenser system at 0921. Turned steam generator pressure down to 50 psig to see what this setting would produce in condensation and PCB reaction time. A Jabsco electric pump was plumbed up in an attempt to keep the mechanical seal cool. Mechanical seal temp is 180°F at 1030. Still condensing liquid off reactor at 1300. Steam pressure increased to 75 psig.

With reactor temperature at 130°C, the mechanical seal temp was >200°F. The improvised cooling system didn't seem to absorb much heat. PVC tubing from the water drum was still cool to the touch, as was the reactor-mounted factory cooling system.

Since condensate was still coming over at 1330, pressure was turned to 100 psig. Condensate still boiling over at 1400. Reactor temperature went to >150°C. Steam generator turned down to 50 psig at 1505. Condensate flow stopped at 1510. Reactor temp dropped to 150°C at 1520. These experiments with the steam generator showed that approximately 80 psig would maintain slurry at 150°C.

Turned steam generator off at 1715. PCB concentration at 1600 was 1.7 ppm. Weighed condensate collection drum before adding water back, net gain 80.0 lb. Added 102.0 lb water back, to dissolve KOH, at 1830. Reactor temp still at 120°C. Theorized that KOH had solidified, so steam generator was turned back on to help dissolve it. At 1915 a quantity of black material boiled into the condenser system. Vent was closed and condensate collection drum was re-weighed to see how much material had come over. Condensate drum had gained another 109 lb! More water added to reactor, 110.5 lb pumped in at 1955 and mixed for 15 min. Decided to try filtering in AM.

Took a number of sound level readings with a Quest™ decibel meter to test effectiveness of sound enclosure for diesel generator and to measure how much noise site personnel are exposed to. Took decibel readings at various points inside the tent and at the next door neighbor's house (Linda Roe) since the noise from the generator has been bothering her. Results:

Sitting next to Mobile Lab	73.5 dBA
At desk, by computer	74 dBA

In front of reactor	83 dBA	
By steam generator	74 dBA	
Back of process trailer	81 dBA	
Process end of trailer, dike	77 dBA	
Process trailer, control room	66 dBA	
Directly behind generator:		
Inside sound enclosure	102 dBA @ 63 Hz	112 dB @125 Hz
Outside sound enclosure	77 dBA@ 63 Hz	96 dB @ 125 Hz
Linda Roe's back deck	63.5 dBA@ 63 Hz	77 dB @ 125 Hz,
	74 dB @ 31.5 Hz	

06/07/88 - Changed ambient air monitors. Took ending weights of condensate #2 drum and NixTox drum. No change in either drum. Attempted to filter out of the bottom plug of the reactor, with the screens in place. Filtered very slowly with plows running at 50 RPM. Applied nitrogen at 50 psig, but improvement in flow was not significant. Increase in nitrogen pressure didn't improve flow noticeably. Heated slurry to 80°C, no improvement. Filtered from 1030 - 1730, net filtrate: 19.0 lb.

While waiting for reactor to filter, attempted some changes to sound enclosure. Changes don't make any difference to next door neighbor. Planned to hang insulated tarps from frame on fence to height of 12' (around northeast corner of fence.)

Since filtering out of the reactor was apparently out of the question, planned to separate and wash with a centrifuge. Ordered Model B50, 5 gallon capacity unit from Clinton Centrifuge. Ordered stainless steel, Teflon-lined, 20 gpm sludge pump, with 1.5" fittings, from Gartner Equipment in Syracuse. Ordered rental diesel-powered, 90 CFM compressor from Meade Supply in Buffalo. Ordered 2 hoses, 1.5", Teflon-lined fuel hose-type, with 1.5" stainless steel camlok fittings, one 25', one 20', from Buffalo Rubber and Supply Co.; also ordered two 50' sections of air hose with .75" Chicago Pneumatic fittings from Buffalo Rubber.

Sampled condensate drum #1. Very little oil noted in condensate, but a large amount of reagent and soil from "burp" of 6/6. Theory: Heat of solution of KOH (from solid) was enough to suddenly raise temp. causing active boiling and foaming into condenser system.

Secured reactor after repair of sticking bottom plug ram. Reactor was filled with foam when mixed prior to sampling. Soil appeared to be much higher in clay than the samples used in the lab simulation. Samples taken for centrifuge testing (with 1 gallon unit) settled quite well from foam to liquid and solid phases.

After changing injection septum in gas chromatograph, a routine leak test revealed cracked graphite/vespel ferrules. The cracks allowed air to reach the ECD foil when it was heated. ECD was removed and sent for reconditioning to avoid problems later on, when an interruption would have hurt our schedule badly.

06/08/88 - Changed ambient air monitors. Checked on equipment needed for centrifuge:

Centrifuge would be shipped from Clinton 6/8, due to arrive by motor freight, Monday, 06/13/88.
Pump parts on order, would be ready in Syracuse by Monday at the latest. To be picked up by TG. We would call back on Friday, 06/10/88 to check on them.
Hoses would be ready at Buffalo Rubber on Monday.

Picked up supplies for adding to sound enclosure, insulated tarps, 12' 2X4s, wire. Erected 6'X25' insulated tarps on uprights attached to NE corner of fence to height of 12'. Noted some reduction of noise at next door neighbor's, but still needed to put something over stack.

Contractor came to cut grass at rental cabin, we cut grass inside fence. Decontaminated respirators and boots, did some general clean up and maintenance. Checked reactor, it had small leak around Filtorr plug, nothing serious. Attempted another repair on bottom of end panel tarp with copious quantities of duct tape.

06/09/88 - (RG only.) Changed ambient air monitors. Went to Buffalo, Meade Supply to straighten out paperwork and deposit for diesel-powered compressor. Finally OK, ready for pick up when we returned to site. Calibrated meteorological station. Worked on met data reduction. Caught up on miscellaneous paperwork. Checked on phone messages, and returned calls.

06/10-06/13 - No work on site.

06/14/88 - Changed ambient air monitors. Did general clean up. Cleaned up small centrifuge. Filled water drums for decon and pump cleaning. Unloaded 5 gallon centrifuge when it arrived by motor freight. Picked up wiring and electrical supplies for powering centrifuge. Wired up centrifuge and checked rotation, all OK. Cleaned up Mobile Lab. Swept entire work area. Staged compressor when it was delivered by EM and JR. Unpacked sludge pump. Ebasco personnel came to collect high PCB soils for GRC to process. They collected drums 11, 12 & 13 from various points around the development, and delivered them to site.

06/15/88 - Changed ambient air monitors. Purchased needed pipe and fittings for mud pump, centrifuge and stingers. Plumbed and hooked up all these items. Built two more fiberglass/CDX/poly sheet sound panels and installed; one more on east side of enclosure and one on top, over the stack. Recheck sound readings: Inside tent, 64-68 dBA, 78 dB @ 63 & 125 Hz; Linda Roe's house, 60 dBA, 75 dB @ 63 & 125 Hz. With a few small modifications the enclosure would be quite satisfactory. Linda Roe said it was much improved.

Reconditioned ECD arrived. It was installed and checked for leaks.

We tested the centrifuge by feeding till we get 5 gallons output. We then stopped and checked solids content.

Sampled drum of used decon water for PCB analysis. Used glass thief through bung. Needed entire thief full for sufficient sample quantity. Sampled drums 11, 12 & 13, high PCB soil, that Ebasco took from development.

Reactor would not run, but mechanical seal pump did run. After a call to Littleford "Safety Pak" and flow limit switches were bypassed individually to check, then reinstalled. Reactor ran after this exercise, but we couldn't explain why. Possibly freed flow switch interlock? Planned to centrifuge tomorrow.

<u>06/16/88</u> - Changed ambient air monitors. Attempted to pump from reactor to centrifuge, with frustrating results. Pump delivered slurry far too quickly, and the centrifuge overflowed. When the pump was throttled back, the pump ball valves plugged up with soil and small pebbles. Planned to modify the entrance valve to the centrifuge with a "T" and three 0.75" ball valves in series to throttle flow to more manageable levels. Other side of "T" could be used for blowing down lines and cleaning. Ordered a 0.75", 3 gpm capacity mud pump from Gartner equipment, specifications on materials the same as with the 1.5" mud pump. RLP would bring pump with him when he returned to the site. Ordered the 0.75" hoses from Buffalo Rubber & Supply; would be ready 06/17/88. Ordered more 0.75" stainless steel ball valves from Peerless Mill Supply in Buffalo.

Lab was not quite ready for PCB analysis, as ECD baseline hadn't stabilized. Drum #11 has PCBs, but we'll have to wait till tomorrow to quantify.

Dumped reactor to modify bottom plug and to clean up for next reaction. Did not finish washing on Reaction #2, but did take sample of soil and reagent.

<u>06/17/88</u> - Changed ambient air monitors. Now had PCB results on drums Ebasco gathered previous week: Drum #11 - 138 ppm; Drum #12 - 400 ppm; Drum #13 - 256 ppm.

Opened reactor and cleaned bottom plug, removed modified screens, returned to original configuration. Received another Filtorr plug from Littleford with 0.75"FNPT threads tapped in the center. We installed a permanent "stinger", angled to the bottom of the reactor chamber, with 0.75" pipe. Outside of the chamber, a valve and "T" were installed to control flow and to allow blow down with nitrogen, either to reactor or to pump.

Plumbed up 0.75" mud pump to centrifuge, using 0,75" SS camloks for connectors. Fabricated stingers for moving liquids into drums. Checked flow of mud pump with water. With inlet 0.75" ball valve approximately half open, air control valve on mud pump open one quarter turn, and outlet 0.75" ball valve open full, flow was close to 3 gpm. Once this flow rate was established, we checked the flow into the centrifuge. Overflow was minimal; total flow in 5 min. was 15 gal. Residual, inlet hose was 2.0 lb, outlet hose is 1.0 lb.

Wired a 24" temperature probe through loading port of reactor, to recording graph. We were now ready to load Drum #12 (400 ppm PCB) for reaction on 06/18/88. Planned to react to <2 ppm, per experimental plan.

06/18/88 - (RXN #3) Changed ambient air monitors. Loaded 200.0 lb soil from Drum #12 for Reaction #3, High PCB. Loaded reagents into reactor, 81 lb 1:1:2 (PEG:TMH: DMSO), 40.5 lb aqueous KOH. Began agitating reactor 0822, turned steam generator at same time. Opened steam to system 0835. Condensation began at 0920, flow very heavy. We left steam pressure at close to maximum to boil off water quickly. Steam at 140 psig by 0930. Reactor temperature to 146°C by 0945, steam pressure backed off to 110 psig. Reactor temp at 150°C by 1000, steam pressure backed off to 75 psig, but condensate was still coming over. Mechanical seal temperature seemed to rise in lockstep with reactor temp, at >200°F by 1000. Condensate finished coming over by 1015.

Tore down mechanical seal pump and reservoir at 1035 to check flow, filter, etc. It was necessary to shut down the reactor agitator while working on mechanical seal. When agitation was restarted, a heavy grinding noise began, with the motor and gearbox oscillating as earlier when a "rock"(?) got caught under the plows.

PCB concentration is <5 ppm by 1100 sample, <2 ppm by 1300 sample. This after being at reaction temperature, 150°C, for only one hour. Total reaction time, including heat up was <5 hours. Reactor shut down spontaneously at 1255, no doubt due to mechanical seal problems. We were able to restart agitation after some judicious "fiddling" with mechanical seal. Steam generator was turned off at 1300. Added water back to reactor to replace condensate. Condensate total, 39.5 lb, added equivalent, plus 20%, or 48.5 lb, at 1400. We then attempted to pump out reactor contents to the centrifuge, using the newly-installed stinger.

We were convinced that the stinger would not work for pumping out the reactor by 1600. Material kept clogging in the 0.75" camlok on side of reactor. We planned to try something different 6/19. Continued mixing till 1700.

06/19/88 - Changed ambient air monitors. Experimented with 1.5" mud pump, check flow rate with 1.5" inlet, 0.75" outlet, with 3 0.75" ball valves in line on outlet. Attempted to pump out reactor at 30°C, kept plugging lines and ball valves in pump. Tried heating to 80°C and pumping it out hot.

Due to problems with the agitator and pumping we "punted" and decanted the reagent off the top of the reactor with the 1.5" pump and ran the reagent through the centrifuge, recovering 101.0 lb. Once the reagent liquid was removed, we opened the reactor and dug the wet soil out, since the plows wouldn't move. Discovered that the 0.75" stinger we installed for pump out had been sheared off and was in the soil somewhere. Would have to look for it once we got soil dumped in polyethylene tubs. Recovered 240.0 lb soil, for a total mass of 341.0 lb. Mass balance was skewed positive since mechanical seal was constantly leaking PEG into the reactor.

Mechanical seal circulatory system showed reagent in the reservoir before we shut down the reactor on 6/18. Removed blades from reactor shaft, and loosened mechanical seal, but were unable to remove it. Planned to use hydraulic ram(s) to move seal out on shaft. Would rent from Meade Supply, since no one closer had one available.

Flushed out mechanical seal circulatory system with water to remove reagent contamination. Called Bill Webber at home to discuss problems. He suspected a faulty pump as the culprit in the destruction of yet another seal.

<u>06/20/88</u> - Changed ambient air monitors. Tore mechanical seal pump down for check. Looked OK to untrained eye. Pulled mechanical seal using hydraulic rams to get it started down the shaft. Faces were not cracked, but inside bearing surface, where the seal contacts the shaft, was pitted and gouged. Mechanical seal and plow blades were put in barrels to soak, as an aid in cleaning them later. Called Dick Kemper, Littleford about new mechanical seal. He said he would let us know 6/21 when he can get us another seal.

We did general clean up and decon of boots and respirators. Held staff meeting to discuss options, schedule. Part of staff will return to Syracuse, Roger and Edwina will remain in Wide Beach. Once mechanical seal replacement was scheduled Roger would call everyone (Wednesday evening, 06/22/88). Schedule could be more accurately predicted then.

<u>06/21/88</u> - Changed ambient air monitors. Edwina worked on GC/MS. Returned hydraulic rams to Meade Supply, got photos developed for RLP. Continued general clean up. Did more scrubbing on mechanical seal and reactor plows, returned them to barrel to soak some more. Picked up shipping supplies for returning mechanical seals to Littleford and water supply pump to Electric Steam Generator.

Talked with Dick Kemper, Littleford again. Bill Webber would be here Wednesday or Thursday. Replacement mechanical seal would be shipped via Emory Air Freight to Buffalo, tracking #CVG-403-04. Would pick up seal 6/22. Littleford was sending a DurIron brand mechanical seal this time, instead of the Crane brand seals we had been so handily destroying.

<u>06/22/88</u> - Changed ambient air monitors. Finish cleaning plow blades, then took them to Lakeside Precision in Dunkirk for straightening and repair. Checked on delivery of mechanical seal, and got directions to Emory Air Freight

in Buffalo. Pulled Filtorr plug from reactor and removed piping and valves. Packed and shipped mechanical seals to Littleford, and water supply pump to Electric Steam Generator. Edwina worked on re-analyzing several samples. Went to Buffalo to pick up Bill Webber and to Emory to pick up mechanical seal.

Edwina and Roger returned to the site after dark to shut down the GC/MS because of a severe thunderstorm. While leaving the site in the dark, Edwina fell and injures her right knee. Roger took her to the Emergency Department at Lakeshore Hospital. She was treated with sutures and antibiotics and released, to return in ten days for suture removal.

<u>06/23/88</u> - Changed ambient air monitors. Edwina worked on Mass Spectrometer calculations. Bill Webber and Roger pull shaft out of reactor after discovering that the shaft has 0.080" runout (axial play). Anything more than 0.008" runout was unacceptable. Also discovered a good deal of pitting on the O-ring race where the mechanical seal fit on the shaft. Took shaft Lakeside Precision for dressing up. We would be able to pick up shaft and plows later in the day. Picked up replacement O-rings in Buffalo. Bill Webber and Roger inspected mechanical seal pump and flow switch and decided to order replacements. Replaced shaft, mechanical seal and plows in the evening.

<u>06/24/88</u> - Changed ambient air monitors. Roger and Bill Webber finished installing repaired and replacement parts on reactor. Reinstalled existing mechanical seal pump and flow switch, without success - didn't work at all. New pump and flow switch installed, still didn't work. Discovered crimped line from mechanical seal, ordered new line. Still wouldn't work properly under pressure, but worked alright at atmospheric.

Bill Webber had to leave site. RG continued to work on mechanical seal system. Discovered his earlier suspicion (that straight PEG 400 was too viscous to maintain flow in small diameter lines and the filter) was correct. PEG was diluted 50% with water. Even with PEG diluted 50%, it would not run under pressure with the filter element in place, but would run all right at atmospheric pressure. Placed another call to Dick Kemper, Littleford, to determine filter size; discovered that 5 micron was acceptable. RG began to shop for appropriate size filter unit in Buffalo area, and found nothing. Littleford was out of the 5 micron size. Finally located a unit in California, and arranged for it to be sent to us via Federal Express, Saturday delivery.

<u>06/25/88</u> - Cleaned up PEG mess from work with mechanical seal and filter, prepared for next reaction: Reinstalled Filtorr plug, adjusted plow blades, buttoned up end panel. Removed old, small filter assembly, plumbed up and installed new, 5 micron filter body. New unit was much larger than the one supplied by Littleford.

Tried mechanical seal system after installing new filter unit, still wouldn't run properly. Discovered that filter body had to be filled first. Once filled, it ran fine, even under pressure.

Held meeting to discuss possible reaction tomorrow. Decided we would begin recycle reactions. We would add condensate replacement water at 150°C and mix for 2 hours, or until KOH exotherm, whichever occurs first.

After some digging and stirring, we found a broken piece of pipe in soil from the last reaction (the broken stinger).

Plumbed up a cooling system for reactor steam jacket. Installed valves in jacket inlet and outlet, ran vinyl tubing to Jabsco pump in 55 gallon drum. Would run cooling water through jacket till reactor temperature drops to approximately 90°C. At that temperature we should be able to pump to centrifuge, and get the separation/washing steps started the day of the reaction.

Did general clean up in preparation for first recycle reaction 06/26/88.

Winds, up to a sustained 30 mph, began to tear front panel apart. Tarp next to Mobile Lab tore right off frame, and the portion covering the process dike area began to rip and unroll from the pipe anchor that we had tied and taped up the previous week.

06/26/88 - (RXN #4) Changed ambient air monitors. Ready for Reaction #4, first recycle run. Took condensate sample from last reaction, from Drum #12. Loaded reactor with 200.0 lb soil from Drum #3, took sample for starting soil PCB concentration, which proved to be 37 ppm. Add 80.0 lb 1:1:2, 40.5 lb KOH. Started reactor at 0825, started steam generator at 0840, opened steam to reactor at 0900. Reactor RPM at 50. Mechanical seal system was running through wash tub filled with crushed ice, temperature stabilized at 60°F! Condensate began coming over at 0935, reactor temperature at 114°C, steam pressure at 75 psig. Steam pressure was maintained at highest possible to get water boiled off as quickly as possible. Condensate was still coming over in very thin stream at 1200, reactor temperature at 142°C. Suspected DMSO is boiling over because of the elevated temperature. Mechanical seal temperature remained constant at 60°F, but required about 16-24 lb of ice added to tub every hour. Steam pressure turned down at 1220, reactor temperature at 147°C, condensate was still dribbling very slowly. Condensate finally stopped coming over at 1250. PCB concentration in reacted soil was <10 ppm by 1200, 1300 sample was 2 ppm. Steam generator was shut down at 1405; 1400 sample was 1.4 ppm.

Added 84.0 lb condensate replacement, condensate weight (70.0 lb) plus 20% (14.0 lb), to reactor at 1420, reactor temperature was 146°C. Reactor temperature dropped to 86°C right after adding water, then climbed back to 106°C. Another 49 lb of condensate came over system after adding water to reactor. No weight gain noted in condensate drum #2, indicating that no vapors were getting past the air cooled condenser.

Began heating reactor again at 1445 to help melt KOH "rock," steam pressure at 40 psig. We planned maintain heat on reactor till KOH exotherm, or 2 hours, whichever came first. What came first, however, was reagent and soil boiling over in condenser system at 1500 (3 PM). Steam generator shut down, vent valve closed, reactor temperature at 110°C. Plan B: Abandon attempt to solubilize KOH "rock" and cool reactor with steam jacket cooling loop. Cooling loop was connected by 1530. Started cooling with reactor temperature at 105°C. Reactor temperature down to 90°C by 1540.

Pumps set up for centrifuging operation by 1630. Attempts to start compressor were unsuccessful. Traced problem to fuel supply, fuel pump will not deliver fuel to injectors. Kept reactor mixing till 1730. When reactor was shut down we opened the loading port and probed the inside. No apparent heavy settling of slurry, just one small lump clinging to side of the reactor in areas not swept by plows.

06/27/88 - Changed ambient air monitors. Hitched compressor to company truck and brought it to Meade Supply in Buffalo for repair or replacement. Meade's mechanic was able to correct fuel delivery problem with new fuel filter, and adjustment of pump.

Condensate Drum #1 was sampled and cleaned out, to remove the soil and reagent that boiled over yesterday. Samples of both the liquid and soil layers were taken, soil weight is 40.5 lb.

Pumped soil slurry from the reactor to the centrifuge, with considerable difficulty. Pump kept clogging because of the slow rate and the constrictions in the outlet line. Finally got reagent centrifuged with over 4 hours of effort. Tim dispatched to Syracuse for a drum mixer. We planned to pump slurry into a 55 gallon drum, with a bottom bung. We would place the drum mixer in the drum to keep the slurry from settling and clogging the bung, and allow the slurry to feed to the centrifuge by gravity at a rate it will tolerate. That would also obviate problems with running the mud pump at such a slow, constricted rate. We discovered, in a phone call to Bruce Ruggles at Gartner Equipment, that constricting the outlet would cause the pump to try to extrude the Teflon diaphragms right out of the pump body.

Planned to finish wash steps 06/28/88.

06/28/88 - Changed ambient air monitors. Finished Wash 1, and subsequent recovery steps. Centrifuging proved to be drudgery of the first order. Soil had to be dug from the solid centrifuge baskets by Roger's hands, since Jim's hands were too big to fit in and get all the soil out. Pumping the soil out was also a strain because the operator had to stand on a stepladder to manipulate the inlet stinger.

Pumping slurry to intermediate drum worked well. There was perhaps 35-50 lb wet soil left in bottom of the intermediate drum that the drum mixer could not keep in slurry once the level drops to within 4" of the bottom.

Mass balance/recovery figures: Reagent recovery step netted 64.5 lb liquid reagent, 147.5 lb soil; Wash #1 saw 117 lb wash added and agitated for 2 hours, 116.5 lb liquid recovered, 134.5 lb soil recovered; Wash #2 had 116.0 lb wash added and agitated for 2.5 hours, 123.5 lb liquid recovered, 115.0 lb soil recovered; Wash #3 had 115.5 lb wash added and agitated for 30 minutes, 119.0 lb liquid recovered, 144.5 lb soil recovered. Samples of each wash step were taken for reagent analysis, as was a sample of the final soil for reagent residual. Soil left in reactor, not picked up by pump stinger = 38.5 lb; total soil recovered with final wash = 144.5 + 38.5.b = 183.0 lb. Reagent analysis told us that we recovered only 50% of 1:1:2, and 0% of the KOH. Initial analysis showed 35% of the DMSO went to the condensate drum

06/29/88 - (RXN #5) Changed ambient air monitors. Loaded 200.0 lb soil from Drum #4, for Reaction #5, Recycle Run #2. Got beginning weights on both condensate drums and NixTox drum. Condensate Drum #2 and NixTox drum have not changed weight since we started the reactions. Pumped recycled reagent into reactor: 62.0 lb. Weighed out 44.0 lb 1:1:2 (PEG:TMH:DMSO) to reconstitute reagent to original specifications. Weighed out 17.0 lb dry, flake KOH to reconstitute reagent.

Began mixing soil in reactor at 0815, for 15 minutes, then took beginning soil sample. Beginning soil PCB concentration was 73 ppm. Pumped recycle reagent and makeup 1:1:2 into reactor, dumped dry makeup KOH into reactor. Began mixing slurry in reactor at 0855. Started steam generator at 0905. Opened steam to system at 0915. Reactor at 110°C, condensate was coming over at 1015. At 1035, with the reactor temperature at 135°C, reagent and soil began blowing over into condenser system. Steam pressure was turned down slightly. By 1045 the condensate was clearing up nicely. We theorized that we were seeing the residue of the "burp" from the last reaction. Steam pressure turned back up to 120 psig. The wash tub used for washing out sample pans, just outside the Pilot Plant, was sampled for PCBs. Soil PCB concentration in reactor was still >10 ppm at 1400.

We noticed approximately 8 psig pressure inside the reactor. Condensate vent lines were all open, some condensate was still coming over, but there must have been some sort of restriction in the line. By 1430 there was no more condensate coming over, but the reactor was still showing +2 psig. (Considered possibility that check valve in condenser line was clogged. Would remove later and recheck.) At 1450 reactor temperature was at 148°C, so steam pressure was turned down to approximately 65 psig. 1500 sample showed 5.2 ppm, but we decided to run till we get a confirming sample at 1600. Reactor temperature began to drop slightly at 1530, so steam pressure turned up slightly to approximately 70 psig. Reactor still showed approximately +1 psig. Steam generator turned off at 1645.

Weight of condensate in drum #1 after reaction was 81.5 lb. Added condensate weight plus 20% back to reactor: 98.0 lb. Pressure in reactor went up to approximately 10 psig when initial water was added (at 146°C reactor temperature), then fell as more water was added. Closed vent valve after adding water, and pressure climbed back to 6 psig, at 1700. Temperature in reactor fell initially, then leveled off at 104°C. Hooked up cooler for steam jacket at 1725. Quit cooling steam jacket at 1733, reactor temperature at 90°C, reactor pressure at -5"Hg.

Set up to do centrifuging/reagent recovery on 6/30.

06/30/88 - Weight of condensate drum # 1 only increased one pound after addition of condensate replacement on 6/29. No change in condensate drum #2 or NixTox drum weight. Condensate drum #1 sampled for reagents and PCBs.

Began centrifuging/recovery operations. Reagent recovery quantities somewhat disappointing: Liquid recovered = 58.0 lb; soil recovered = 153.0 lb. 116.0 lb Wash #1 added and mixed X 30 minutes. Recovery of Wash #1: Liquid recovered = 110. lb; soil recovered = 215.5 lb. 122.0 lb Wash#2 added and mixed X 30 minutes. Recovery of Wash #2: Liquid = 135.5 lb; soil recovered = 168.0 lb. 120.5 lb Wash #3 added and mixed X 30 minutes. Recovery of Wash #3: Liquid = 129.0 lb; soil = 192.5 lb. Soil after centrifuging Wash #1 was quite wet and sloppy. After centrifuging Wash #2 the soil was a dry cake, as it was after Wash #3.

Cleaned out reactor, found a small amount of liquids, and what appears to be KOH stuck to the sides.

Analysis of reagent, condensate and washes for PEG, TMH, DMSO and KOH indicated that we would need to reconstitute with 50% fresh chemicals to bring reagent mix up to proper strength. This was economically and technically unacceptable. Countercurrent washing does not appear to be working as we had hoped. Reaction scheduled for 7/1 was postponed so we could finish analysis and come up with some ideas for getting chemicals back into the reaction chain.

07/01/88 - Finished analyzing condensate and soil residual reagent fractions. Found total recovery of PEG, TMH, DMSO in all of the washes is 90+%, but recovery of KOH was <50%. When soil was titrated for KOH residual, approximately 10-15% was found. Hence approximately 50% KOH was being consumed in the reaction. It would appear that countercurrent washing was not allowing us to get reagent components back into the recycle chain. We needed some way to concentrate reagents and washes.

We removed check valve from reactor vent line. Theory: Check valve could be part of problem in loss of DMSO, preventing any reflux back into reactor. Condenser system was cleaned and flushed. General clean up done for entire site.

After discussing several options, we decided on distilling water off of all recovered reagents and washes and the condensate, then adding the remaining reagent back to the reaction. Planned to do test next week using a 55 gallon drum and drum heaters. Unfortunately the condensate from Reaction #5 had already been dumped, after sampling. We would start recycling condensate after the next reaction. We also planned to sample condensate at different temperatures during the heat up to determine when the DMSO started coming over. Planned to start sampling at 110°C, and in 5° increments thereafter.

07/02 - 04/88 - No work on site.

07/05/88 - We assembled Distillation System (see schematic of Distillation System, first iteration, Appendix ___) System consisted of 55 gallon drum still, Teflon-lined stainless steel braided hose, 55 gallon distillate receiver drum (on electronic scale), PVC tubing out of top of receiver drum, 50' 0.5" copper refrigerator tubing in a wash tub (ice cooler/condenser), second 55 gallon drum distillate receiver, PVC tubing to Clorox/water bubbler. We hooked up temperature recorder to monitor progress and establish heat up curve.

Planned to do test on Distillation System 7/6 using 50 lb 1:1:2, 25 lb 45% KOH and 75 lb water.

07/06/88 - Set up to test Distillation System. Poured 1:1:2, KOH and water into still drum. Applied drum heaters to still drum. Since level was so low, we could only use one heater. Wrapped insulation blanket on still drum and plugged in 1000 watt drum heater. Began heating at 0810. Initial temperature: 30°C.

After heating for >4 hours temperature was only 94°C. Such a heat up rate was unacceptably slow. We discontinued this test and considered heating alternatives.

Settled on a gas (LPG) barbecue grill for heat source. Purchased barbecue grill with advertised capacity of 40,000 Btu/Hr.

07/07/88 - Set up with grill tub and burner on blocks on ground, with lava rocks in place (see drawing, Appendix ___) Planned to test still with gas grill 7/8. Tried brief heat up, temperature went quickly to 115°C and water began to boil off. Distillate receiver got unacceptably hot, vapors blew over into second distillate receiver. Stainless steel braided, Teflon-lined hose is apparently insufficient for cooling/condensing. We needed to consider another type of cooler. Discovered a custom radiator manufacturer in Buffalo, said they might be able to build us something on a rush basis. We stopped at Mr. Radiator when we went to Buffalo to do other business.

Picked up custom-built radiator (Mr. Radiator built it in 2 hours!) and installed in-line on Distillation system. Hung radiator from one-high scaffold, wired an inexpensive 20" 3-speed box fan to the back of the radiator, with a clear 1" PVC line coming off the bottom of the radiator. Kept stainless steel braided line off the still drum and ran it to the inlet on top tank of radiator (see drawing, Distillation System, Second Iteration, Appendix___)

07/08/88 - Tested Distillation System with gas grill for heat source. Began heating at 0845. Condensed 13.0 lb by 1100, 54.0 lb by 1400, stopped at 60.0 lb at 1430, shut down test. Decided to go ahead with distilling reagents and washes from Reaction #5.

Pumped reagent/washes into still drum via 1 gallon, 2200 g centrifuge to remove as much solids as possible. Centrifuge removed only a total of 2.5 lb solids, another ll.5 lb solids have settled in various containers.

Purchased a 40 lb propane tank to supplement 20 lb tank that came with the gas grill.

07/09/88 - 0645: Dressed out to load reactor with 200.0 lb soil from Drum #5, for Reaction #6, Recycle #3. Set up to distill reagent and Washes #1 & #2, from Reaction #5, in makeshift Distillation System. Began heating still at 0745, beginning temperature 24°C. Distilled 8.0 lb from still by 1040, still temperature at 102°C. By 1440, 61.0 lb of distillate had been collected. Reagent and distillate from test run on 07/08/8 were sampled for reagent analysis. Soil in reactor mixed for 15 min. and sampled for starting PCB concentration.

141.5 lb distillate collected by 2030. No condensation noted in ice cooler or collection drum #2. 150.0 lb distillate collected by 2110, burner shut off, insulation removed. Ending temperature 112°C

07/10/88 - (RXN #6) Reagent left in still drum after distilling off water = 104.5 lb. Sampled reagent and distillate for reagent analysis. Analysis showed that we needed to reconstitute with 15.5 lb dry KOH, 5.5 lb PEG and 15.5 lb DMSO to return reagent to original strength. Reagent from distillation and 1:1:2 for refortification pumped into reactor. Dry KOH dumped into loading port of reactor.

Beginning soil concentration PCB = 83 ppm

Started reactor mixing at 0920, steam generator started at 0921. 250KW diesel generator immediately began to slow down, causing lights to dim and flicker, motors to drag. Turned steam generator off, diesel generator recovers, sounds normal. We left the diesel generator running, with the steam generator off, and took amperage readings at various points in the electrical distribution. Found that the diesel generator was not running at the appropriate speed, not producing the power needed for the load. Decided to replace the fuel and air filters, check again when replaced.

Purchased fuel filter and installed. Unable to locate air filter, so we cleaned the one in the housing. Restarted the reaction at 1035. Generator shut down at 1040. Tried cleaning air filter, checked fuel flow, restarted reaction at 1155. Generator shut down again at 1200. Planned to call mechanic from RB U'Ren, restart reaction on 7/11.

Did general clean up, caught up on analysis.

07/11/88 - Mechanic arrived at 0900, replaced air filter, cleaned fuel pump inlet. Generator ran fine after that. Restarted Reaction #6 at 1010. Reaction progressed without incident till 1400 when condensate return pump on steam generator failed. We disconnected pump on unit, replaced it with 0.75" mud pump, were able to continue with reaction. While changing pumps over, pressure in steam generator fell to 40 psig, reactor temperature fell to 128°C.

Condensate stopped coming over at 1415, so reactor vent closed. Pressure in reactor climbed to around 4 psig by 1430. The reactor vent was cracked open at 1440 when pressure in the reactor reached 8 psig.

Steam generator shut down at 1600. PCB concentration <10 ppm at 1500, confirmed at 2.5 ppm at 1600. Total condensate in Condensate Drum #1 = 75.5 lb. Added back condensate replacement plus 20%, or 89.0 lb at 1625. With reactor temperature initially at 138°C, reactor temperature dropped to 102°C. Set up to cool reactor jacket at 1650, reactor temperature back up to 112°C. Reactor temperature down to 90°C at 1654, stopped cooling pump.

07/12/88 - Weighed and took sample from condensate Drum #1, gained 1.5 lb from condensate replacement step.

Began centrifuging/recovery operation. Reagent recovery step went much as Reaction #5. Liquid recovery = 88.0 lb; soil recovery = 83.0 lb. Wash#1, input =119.5 lb (Wash #3, Reaction #5); liquids recovery = 132.0 lb; soil = 185.0 lb. Wash #2, input = 119.0 lb (fresh water); liquids recovery = 126.0 lb; soil recovery = 165.0 lb. Wash #3, input =116.0 lb (fresh water); liquid recovery = 136.0 lb; soil recovery = 209.0 lb. Additionally there was a total of 60.5 lb slurry left in reactor, of which we decanted 7.5 lb free liquid, leaving 53.0 lb wet soil.

After analyzing the condensate from the last reaction, that contained >20% DMSO, it was decided that all reagent recovery steps would include the condensate. This would help recover higher percentages of missing reagents.

Reagent, Wash #1 & 2, condensate drum #1, pumped into the still drum, via 1 gallon centrifuge. Recovered total of 2.0 lb solids from Wash #1, none from Reagent, Wash #2, or condensate. Pumped in total of 423.0 lb on first pass, unable to get 23.5 lb of Wash #2 in still drum, due to space limitations. Begin heating Distillation System at 1150. Will heat/distill for 24 hours, or until approximately 290 lb is distilled, or the temperature in still drum rises over

110°C. Site personnel stayed with Distillation around the clock, to service the system as necessary, and as fire watch. Still drum was boiling by 1700.

07/13/88 - Continued distilling water off reagent/condensate. 110.0 lb collected by 0200, temperature in still drum, 102°C.

200.0 lb soil from Drum #6 loaded into reactor, for Reaction #7, mixed in reactor for 20 min. Sample taken for starting soil PCB concentration.

202.0 lb distillate collected by 1000 (10 AM). Distillation continued till 1555 when distillate weight reaches 276.0 lb, still temperature reached 129°C. Heat turned off, still drum insulation removed, began cooling with a 20" box fan. Removed still drum from grill rack at 1745, decanted reagent into poly tub, recovering 116.5 lb. Last bit of reagent in drum was tarry and thick, poured very slowly. Weight of still drum after dumping reagent = 54.5 lb. Tare weight of still drum = 39.5 lb. Residual in still drum = 15.0 lb. Distillate receiver and still drum sampled for reagent analysis at 1820.

Got tare weights on condensate drum #1 and NixTox drum. Condensate drum #1 was now 52.0 lb. NixTox drum was now 289.0, but no condensate had appeared in condensate drum #2, so it was theorized that NixTox had simply absorbed some weight from the extremely high ambient humidity, or that the weight change was due to scale tolerance.

07/14/88 - (RXN #7) Reagent refortification: 3.0 lb DMSO, 2.0 lb PEG, 17.0 lb dry KOH needed to bring reagent to original strength. Dry KOH dumped in loading port of reactor, liquid reagent, 115.5 lb + 5.0 lb refortification pumped into reactor through reagent loading port.

Started steam generator at 0740. Started reactor agitating at 0745, beginning temperature, 54°C. Opened steam line to reactor at 0750.

Beginning soil PCB concentration was 108 ppm. Condensate began coming over at 0845, reactor temperature, 113°C. Sample of condensate coming over taken at 1120, reactor temperature 132°C. Another sample of condensate was taken at 1145, reactor temperature 150°C. Steam pressure turned down, since reactor at reaction temperature. Vent valve closed at 1215, as material was still condensing over. PCB concentration was <10 ppm by 1200. Steam turned off to reactor at 1320, 1300 sample PCB concentration was 1.1 ppm.

Condensate weight = 74.5 lb. Pump 23.0 lb of Wash #2, left over from distillation, and 64.5 lb of Wash #3, both from centrifuging/recovery steps on Reaction #6, for total of 87.5 lb condensate replacement (condensate + 20% = 87.5 lb). Weight of condensate after adding replacement = 76.0 lb, gain 1.5 lb from flash over. Unable to do all centrifuging/recovery steps on this date because JR left for vacation.

Hooked up cooling pump to jacket at 1340, began cooling, reactor temperature at 110°C. Turned off cooling pump at 1350, reactor temperature 89°C. Set up pumps for centrifuging/recovery steps. Did reagent recovery only. Reagent recovered, liquids = 94.0 lb, soil = 33.0 lb (very poor soil recovery). Reagent and Condensate were pumped into the still drum.

TG & JR leave for Syracuse.

07/15/88 - No work on site.

07/16/88 - Finished up recovery/Washes for Reaction #7,Wash #1 input, 56.0 lb (from Wash#3 Reaction #6) and 58.5 lb fresh water, agitated for 45 min; recovery, liquids = 145.5 lb + 5.0 lb solids in tub, soil = 124.0 lb. During the Wash #1 Tim cut his finger on the drum feeding the centrifuge. Roger took Tim to the Emergency room where he received medical attention and sutures. Returned to the site to add water for Wash #2.

07/17/88 - Wash #2 input 116.0 lb fresh water, agitated 60 min; recovery, liquids = 120.0 lb + 19.0 lb in tub, soil = 85.0 lb. Wash #3 input, 121.0 lb fresh water; recovery, liquids = 135.5, soil = 153.0 lb.

As soon as Wash #1 was completed, it was pumped into the still drum with reagent, via the 1 gallon centrifuge. As much of Wash #2 as would fit was pumped in via the small centrifuge. Solids recovered from 1 gallon centrifuge = 5.5 lb, from both Wash #1 & 2. Began heating reagent/washes for reagent recycle, Reaction #7. Tried drum mixer in still drum, to see if we could cut down on the amount of precipitated solids left when distillation complete.

Vapor leak developed around bung where drum mixer was installed in still drum. Drum mixer removed at 1920. Still drum developed vapor leaks around lid gasket at 1925. Heat turned off and drum allowed to cool overnight to correct problems.

07/18/88 - Began heating Distillation System at 1130. Began to boil off distillate at 1330, temperature at 102°C. Planned to run distillation overnight. Initial boil-off rate high, 17.5-20.5 lb/hour. A good bit of reagent boils over in system. Would have to distill the distillate again when we return to site.

07/19/88 - Reagent recovered from distillation = 77.0 lb. Total distillate found in distillate receiver = 296.5 lb, temperature at end, 122°C. Residual in still drum = 51.0 lb, material in bottom of drum is dry and cake-like. Residual solids were sampled for reagent analysis, as were liquids.

07/20/88 - Sampled distillate from boil-off finished yesterday, for reagent components. Sampled final soil from Reaction #7, Recycle #4 and soil/solids from 1 gallon centrifuge, (Wash #1 & 2, reagent and condensate) for reagent components. Site shut down so RG & RLP can go to AmTek job, Lafayette, IN. Planned to return in August.

<u>08/09/88</u> - Returned to site after several weeks away. Crew consisted of Tim, Jim and Roger, as Edwina is needed in Syracuse to finish other projects. Began distillation of distillate/reagent from last reaction (#7). Distillate contained an unknown amount of reagent that "burped" over in last distillation run. Began heating, around the clock, at 1800, temperature 34°C.

Did general clean/straightened in preparation for Reaction #8, Recycle #5.

<u>08/10/88</u> - Continued distillation of reagent/condensate from yesterday.

Loaded 200.0 lb soil into reactor from Drum #7. Prepared for Reaction #8.

Shut down distillation run at 2115, total distilled = 226.5 lb, temperature at 115°C.

<u>08/11/88</u> - (RXN #8) Took sample of liquid and solids in still drum for reagent analysis. Also sampled distillate in receiver for reagent analysis. Reagent recovery in still drum: liquids = 22.5 lb, solids = 4.5 lb.

Mixed soil from Drum #7 for 15 minutes, took sample for beginning soil PCB concentration.

Loaded reagents to reactor, 77.0 lb from first distillation + 22.5 lb (liquid) + 4.5 lb (solids) from second distillation , for a total of 104.0 lb from distillation. Decided to add solids since they may contain reagents that would be useful in the reaction.

Reagent refortification: Dry KOH = 13.0 lb, PEG = 2.0 lb, TMH = 9.5 lb, DMSO = 16.0 lb, all added to reactor, total reagent = 144.5 lb.

Started reactor and steam generator at 0935, beginning reactor temperature, 33°C. Opened steam valve to system at 1000. Beginning soil PCB concentration: 92 ppm. Condensate began to come over in vent system at 1200, reactor temperature 113°C. Condensate stream sampled at 1335 for reagent analysis, reactor temperature 120°C. PCB concentration to <10 ppm by 1600. Ending soil PCB concentration, 7.8 ppm at 1600. Closed vent valve in reactor, began reducing steam pressure at 1430, reactor temperature 137°C. Pressure in reactor goes to 15 psig, so vent valve was cracked open to relieve pressure, reactor temperature >150°C. Valve was left open, but a slight pressure remained in reactor, 1-2 psig. 1600 reactor sample was difficult to obtain, perhaps because level in reactor was too low? Steam generator shut down at 1630. Condensate collected from Reaction #8 = 60.0 lb. Condensate replacement added back to reactor = 72.0 lb, or condensate + 20%, at 1655. Temperature when condensate replacement added, 146°C. Reactor temperature fell to 116°C, slurry agitated 30 minutes. Jacket cool-down not required since we planned to centrifuge the reaction after midnight.

08/12/88 - Began centrifuging/recovery for Reaction #8, Recycle 5 at 2400. Reweighed condensate Drum #1, after adding condensate replacement back to reactor (8/11), net weight = 64.0 lb, a gain of 4.0 lb from condensate replacement flashing to steam, and condensing over. Condensate sampled for PCB and reagent analysis.

Reagent recovery, liquids = 127.0 lb (including 4.0 lb solids); reagent recovery, soil = 141.5 lb. Wash #1, input, liquid = 123.5 lb (from Wash #3, Reaction #7); output, liquid = 131.5 lb, soil = 144.5 lb. Wash #2, input liquid = 116.0 lb (fresh water); output, liquid = 131.5 lb, soil = 146.5 lb. Wash #3, input liquid = 113.5 lb (fresh water); output, liquid = 127.0 lb, soil = 139.0 lb. Emptied reactor, recovered 41.0 lb soil, 51.0 lb liquids, making final recovery of soil = 180.0 lb.

As soon as liquids from reagent recovery, Wash #1 and Wash #2 were out of the centrifuge, sampled and weighed, they were pumped into the still drum. Attempted to pump through the 1 gallon centrifuge into still drum, but the motor on centrifuge froze up, so liquids pumped directly into still. Began heating still with condensate, reagent, and Wash #1 as soon as still drum was filled, at 0530. Beginning temperature in the still drum was 34°C. Goal: Distill off 150.0 lb or reach 115°C before adding Wash#2. Goal after adding Wash#2: Distill off 320.0 lb total, or reach 115°C. Still drum began boiling at 0810. Initial distillation rate = 12-14 lb/hour. Remainder of Wash #2 added to still drum at 0001, 08/13/88, began reheat.

08/13/88 - Continued distillation of reagent and washes from Reaction #8. After adding remainder of Wash #2 at 0001, reheated to boiling temperature. Temperature at addition Wash #2, 63°C. Began to boil again at approximately 0230.

Continued distillation, did general clean up and maintenance. Continued analysis chores.

Still drum temperature reached 115°C at 2230. Heating stopped, insulation removed from still drum to allow drum to cool, ending weight of distillate = 245.5 lb.

08/14/88 - Net weight of reagent in still drum = 154.0 lb. Reagent dumped into poly tub for pumping into reactor. Much of reagent weight in still drum was solids, nearly half. Net liquids = 72.5 lb, net solids = 67.0 lb. Sampled both liquids and solids for reagent components. Sampled distillate for reagent components. Solids would be loaded into the next reaction (#9) since they contained reagent materials.

Loaded 201.0 lb soil from Drum #8, in preparation for Reaction #9, Recycle #6. Agitated 15 minutes and sampled for beginning soil PCB concentration. Got new tare weights on both reaction condensate drums and NixTox drums, no measurable changes in Condensate #2, or NixTox, but Condensate #1 was now +2.5 lb due to solids left over from various "burp" episodes. Tare weight still drum was +11.5 lb, due to solids caked on bottom and sides.

08/15/88 - (RXN #9) Reagent refortification: TMH = 6.0 lb, dry KOH = 14.5 lb added to reactor to bring reagent to original strength. Total reagent, including solids from still drum = 174.5 lb.

Started reactor agitating at 0745, started steam generator at same time. Beginning reactor temperature, 43°C. Opened steam to reactor at 0755. Beginning soil PCB concentration: 97 ppm. Began condensing volatiles over at 0910, reactor temperature at 107°C. PCB concentration 10 ppm by 1200. Sampling became very difficult by 1300, we were unable to obtain a sample. Steam generator shut down at 1315. PCB concentration 5.7 ppm at 1300. Swapped electrical leads to 50KW diesel generator, kept mixing slurry. Net weight condensate boiled over = 83.0 lb. Pumped in condensate equivalent + 20%, 101.0 lb water, for condensate replacement, resolubilized KOH, reactor temperature at 136°C. Condensate sampled for PCB concentration and reagent components.

Set up pumps and other equipment for centrifuging/reagent recovery steps.

08/16/88 - Began centrifuging/recovery step at 2400. Reagent recovery, liquids = 104.5 lb, soil = 175.0 lb. Wash #1 input = 127.0 lb (from Wash #3, Reaction #8); output, liquids = 139.0 lb, soil = 192.5 lb. Wash #2 input = 116.5 lb (fresh water); output, liquids = 119.5 lb, soil = 180.0 lb. Wash #3 input = 110.0 lb (fresh water); output, liquids = 120.5 lb (including 6.0 lb emptied from reactor), soil = 135.0 lb (including 78.5 lb soil emptied from reactor). Each wash output, liquids and sampled for reagent components as it came out of centrifuge. Final, washed soil sampled for reagent components.

As reagent and Wash #1 were recovered from centrifuging step they were pumped into still drum. 1 gallon centrifuge still not working, so reagents and washes not checked for residual solids. Began heating still drum at 0400 with condensate,reagent, and Wash #1. Beginning temperature 32.5°C. Began to boil over distillate at 0730 - 0745, temperature at 96°C. (Note: Still temperatures showed less than boiling temperature of 100°C since Fluke instrument needs complex calibration that the crew didn't have to time to execute.) Wash #2 added into still drum at 2300. Total distillate in receiver when Wash #2 added = 147.0 lb. Temperature in still dropped to 72°C when Wash #2 added. Still drum began to boil again at 0130 on 08/17/88.

08/17/88 - Continued with reagent distillation. Shut down heating on still drum at 1600. Removed insulation and begin cooling drum with 20" box fan.

Total distillate in receiver drum = 241.5 lb. Reagents dumped out of still drum, liquids = 144.0 lbs, solids = 31.0 lb. Liquids and solids sampled for reagent components. Weight of still drum after scraping out solids = 57.0 lb; tare weight, before this distillation run = 57.5 lb, so we apparently were more efficient at scraping out solids this time.

Loaded reactor with 200.0 lb soil from Drum #9 for Reaction #10, Recycle #7. Soil mixed 15 minutes and sampled for beginning soil PCB concentration.

Reagent refortification: Needed to add, PEG = 0.0 lb, TMH = 0.5 lb, DMSO = 11.5 lb, dry KOH = 11.5 lb, to bring reagent to original strength.

Rented high pressure power washer for general decon and equipment cleaning.

08/18/88 - (RXN #10) Loaded reagents into reactor, 144.0 lb liquids from distillation, 31.0 lb solids from distillation, 0.5 lb fresh TMH, II.5 lb fresh DMSO, 11.5 lb dry KOH, for total 198.5 lb reagent.

Started reactor and steam generator at 0730. Beginning reactor temperature 36°C. Opened steam to system at 0745. Began condensing material over at 0820, reactor temperature at 110°C. Condensate turned black almost immediately, probably from reactor being a little too full, and foaming/ overflowing as water was boiling off. Condensate cleared up at 0830. Beginning soil PCB concentration: 79 ppm. PCB concentration to <10 ppm by 1300. Shut steam down at 1400, after taking confirming PCB sample from reactor. Condensed over 128.5 lb in condensate drum #1. Added condensate makeup 129 lb at 1415. Condensate drum gained 1.0 lb in flashover when adding replacement into reactor. Condensate sampled for PCB and reagent components. Took sample of final reaction slurry for centrifuge testing by Bird Centrifuge, 52.0 lb. Reweighed condensate drum #2 and NixTox drum, no change. Shut down reactor and processing area. Planned to return on graveyard shift to do centrifuging/recovery step.

Began equipment cleaning/general decon with power washer.

08/19/88 - Began reagent recovery/washing step at 2400. Reagent output, liquids = 125.0 lb, soil = 153.5 lb. Wash #1, input = 114.0 lb (Wash #3, Reaction #9); output, liquids = 136.0 lb, soil = 153.0 lb. Wash #2, input = 110.5 lb (fresh water); output, liquids = 110.5 lb, soil = 123.0 lb. Wash #3, input = 111.0 lb (fresh water); output, liquids = 136.0 lb (including 16.0 lb left in reactor), soil =

153.0 lb (including 34.0 lb left in reactor). Each wash and soil output was sampled for reagent components, as was final washed soil.

Finished equipment cleaning, decon. Disassembled centrifuge and distillation scaffolding, returned to rental vendor. Returned power washer to rental vendor. Crew dispersed to various homes for several days off. Planned return to site on night of 08/25/88.

08/20 - 25/88 - No work on site.

08/26/88 - 0700 Took wipe samples for PCBs. Sampled inside reactor; underneath reactor on support plate; dike inside trailer in front of reactor; inside south wall of tent, nearest working end of trailer; inside 1 gallon centrifuge, inside 5 gallon centrifuge; blank was taken while standing inside process dike.

Staged and numbered waste drums for shipment via ENSCO early in September. Staged and numbered 39 drums, two with Hypalon and poly sheet dike material, five with used protective clothing, fourteen with liquid wastes, and eighteen with solids/soil wastes.

08/27 - 09/01/88 - No work on site.

09/02/88 - On site to take samples of reacted soils for Ebasco. Took one sample to send to Hittman Ebasco Associates, 9151 Ramsey Rd., Columbia, MD 21045, Attn: Betsy Picural. Took four samples to send to IT Corporation, 17605 Fabrica Way, Suite A, Cerritos, CA 90701, Attn: Lynda Deschambault. Took one sample to send to NUS Corporation, Laboratory Services, 5350 Campbello Run Rd., Pittsburgh, PA 15205, Attn: Mary Beth Stefanosky.

Labeled all drums for shipment with required ORM-E labels. Weighed all drums, some are in excess of 600.0 lb. Finished at 2200.

09/03 - 09/05/88 - No work on site.

09/06/88 - Loaded waste drums into rental truck, rolled drums into van on a ramp. All ready for ENSCO to pick up on 9/7.

09/07/88 - ENSCO here to pick up wastes. Drums loaded into transporter from rental truck, went quite smoothly.

A drum with a small amount of reacted slurry is discovered under the temporary table inside the tent. The drum was missed when packing up waste drums. Sampled for PCB.

09/08 - 09/19/88 - No work on site.

09/20/88 - RG on site to pick up 5 gallon sample for centrifuge testing by Bird Centrifuge in Boston.

09/21/88 - RG drove to Boston with samples.

09/22/88 - RG at Bird Centrifuge for slurry testing.

Appendix 3 - Run sheets from pilot plant operation

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 1 Site Personnel, RG, TG, EM, RP, JR

Date: 06/01 - 02/88

(Note: All Weights in pounds, unless other wise noted) Recycle #

Soil Weight Added: 200.0lb

Percent Moisture: 11.5%

Reagent Recycled from Previous Reaction

Chemicals	Liquids	Solids
KOH		
PEG		
TMH		
DMSO		
Water		
Total		
Total, w/Makeup		127

Makeup Reagents to original concentrations

KOH(dry)	18.5	(45% of 41 lb aqueous)
PEG	21.5	
TMH	21.5	
DMSO	43	

Reactor RPM 50

REACTION

	Time	Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry
start	0930	8				26	30
	1100					2.7	1.9
						1.7	1.1
						1	0.7

Final soil 0.17

Turn off steam generator, time: 1407

Temp before adding KOH solution water back to reactor: Time: 1535

Temp after adding water back to reactor:

Time, stop mixing: 1605

Notes: Temp probe not long enough to reach slurry in reactor, reactor showed 55°C through most of the reaction.

	Cond. Drum #1		Cond.Drum #2	Nixtox Drum
Initital Weight	50.5		51.5	286.5
Final Weight	107.5		51.5	288
Lbs. gained	57		0	1.5
Weight after solution water	106.5			
Lbs. gained	-1	(scale tolerance)		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	fresh	fresh			
Water Added	55	126	126			
Mix Time	30min	30min	30min			
Liquid or Mass recovered	83.5	187.5	*126		125	57
KOH	0.7	11.9	5.7		3.7	0
PEG	14.2	2.8	0.4		0	0
TMH	12.9	3	2.3		1	0.5
DMSO	20	4.5	3.3		0.7	12.1
Soil recovered			*125			
Soil lost						
				%Moisture	25.90%	
Solids recovered sm. centrifuge						

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
PEG			
TMH			
DMSO			
KOH			
Total			

Notes: *Estimated weights, because handle was bumped and reactor emptied precipitously, scattering all over the inside of the process trailer.

Run # 2 Site Personnel, RG, TG, EM, RP, JR Date: 06/06 - 07/88
(Note: All Weights in pounds, unless other wise noted) Recycle #

Soil Weight Added: 200.0lb Percent Moisture: 20.0%

Reagent Recycled from Previous Reaction			Makeup Reagents to original concentrations		
Chemicals	Liquids	Solids			
KOH			KOH (dry)	18	(45% of 40lb. aqueous)
PEG			PEG	20.1	
TMH			TMH	20.1	
DMSO			DMSO	40.3	
Water					
Total					
Total, w/Makeup				120.5	

Reactor RPM 50

REACTION

	Time	Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry
Start	0820	9				83	106
	0900	9	95		95	77	85.9
	1000	9	112		50	72	53.4
	1100	9	122		50	63	46.2
	1200	9	126		50	31	25.5
	1300	9	130		75	14	10.8
	1400	9	143		100	5.5	4.5
	1500	9	150		50	3.5	2.6
	1600	9	143		40	1.7	1.4
	1700	9	149			Final soil	1.1

Turn off steam generator, time: 1715, and again @ 1915
Temp before adding KOH solution water back to reactor: 136°C Time: 1815
Temp after adding water back to reactor: 120°C
Time, stop mixing: 2015

Notes: 1955 added another 110.5lb water after "burp" over in condensate system, reagent and soil boiling over.

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Inititial Weight	51	51	288
Final Weight	130.5	52	286.5
Lbs. gained	79.5	1	-1.5
Weight after		(scale tolerance)	(scale tolerance)
solution water	239.5		
Lbs. gained	109	See chronology for further explanation.	

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	fresh	fresh			
Water Added	212.5					
Mix Time	30min	30min	30min			
Liquid or Mass recovered	19				258	188.5
KOH	0.4				5.7	1.8
PEG	1.5				7.7	9.9
TMH	1				5	6.5
DMSO	1.3				7.5	23.4
Soil recovered						
Soil lost						
				%Moisture	25.8	
Solids recovered sm. centrifuge						

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
PEG			
TMH			
DMSO			
KOH			
Total			

Notes: No washes done on Reaction #2. Ordered 5 gallon centrifuge, pumps and hoses after this reaction.

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 3 Site Personnel, RG, TG, EM, JR Date: 06/18 - 19/88

(Note: All Weights in pounds, unless other wise noted) Recycle #

Soil Weight Added: 200.0lb Percent Moisture: 20.0%

Reagent Recycled from Previous Reaction			Makeup Reagents to original concentrations		
Chemicals	Liquids	Solids			
KOH			KOH (dry)	18.2	(45% of 40.5lb. aqueous)
PEG			PEG	20.4	
TMH			TMH	20.4	
DMSO			DMSO	40.7	
Water					
Total					
Total, w/Makeup				122	

Reactor RPM 50

REACTION

Time		Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry
start	0822	9.5	22			260	276
	O900	9.5	76			130	139
	1000	12	150			13	11
	1100	11	148			3.3	2.4
	1200	10	150			3.4	2.9
	1300	11	144			1.4	1

Final soil 2.4

Turn off steam generator, time: 1320

Temp before adding KOH solution water back to reactor: Time: 1400

Temp after adding water back to reactor:

Time, stop mixing: 1500

Notes:

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	52	52	286.5
Final Weight	91.5	52	286.5
Lbs. gained	39.5	0	0
Weight after solution water	91.5		
Lbs. gained	0		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	fresh	fresh			
Water Added	48.5					
Mix Time	30min	30min	30min			
Liquid or Mass recovered	101				244	39.5
KOH	0.4				10.7	0.1
PEG	20.2				7.4	0
TMH	13.1				3.5	0.4
DMSO	15.7				5.5	9
Soil recovered						
Soil lost						
				%Moisture	25.8	
Solids recovered sm. centrifuge						

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
PEG			
TMH			
DMSO			
KOH			
Total			

Notes: No washing done for this reaction.

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 4 Site Personnel, RG, TG, EM, JR Date: 06/26 - 28/88
(Note: All Weights in pounds, unless other wise noted) Recycle #1

Soil Weight Added: 200.0lb Percent Moisture: 20.2%

Reagent Recycled from Previous Reaction			Makeup Reagents to original concentrations		
Chemicals	Liquids	Solids			
KOH			KOH(dry)	18.2	(45% of 40.5lb aqueous)
PEG			PEG	20	
TMH			TMH	20	
DMSO			DMSO	40	
Water					
Total					
Total, w/Makeup				120.5	

Reactor RPM 50

REACTION

	Reactor		Steam Generator		PCB Conc, ppm	
Time	Amps	Temp, °C	Amps	Press, psig	Wet	Dry
start 0825	8	20			60	77.8
0900	9	70	100	30		35.2
1000	9	118	70	120	88	65.2
1100	9	130	70	120		24.5
1200	9	142	50	120		7.8
1300	9	148	<50	75		2.1
1400	9	150	<50	75		1.4
					Final soil	1.2

Turn off steam generator, time: 1405
Temp before adding KOH solution water back to reactor: 146°C Time: 1420
Temp after adding water back to reactor: 106°C
Time, stop mixing: 1730

Notes:

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	52	51.5	286.5
Final Weight	122	51.5	286.5
Lbs. gained	70	0	0
Weight after solution water	171		
Lbs. gained	49	(see chronology, re: reactor, "burp." Still reheating solution water back to reactor after adding)	

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	fresh	fresh	fresh		
Water Added	84	117.5	116	115/5		
Mix Time		120 min.	150 min.	30 min.		
Liquid or Mass recovered	64.5	116.5	123.5	119	144.5	119 (incl. soil)
KOH	0.9	2.8	1.1	0.6	0.7	1.2
PEG	12.8	6	3	0.7	117	1.5
TMH	9.3	3.6	1.5	0.7	0.5	4.4
DMSO	13.2	5.8	2.2	0.9	0.5	16.8
Soil recovered	147.5	134.5	115	144.5		
Soil lost	3.5	0	0			
				%Moisture	33.30%	

Solids recovered sm. centrifuge

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
PEG			
TMH			
DMSO			
KOH			
Total			

Notes:

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 5 Site Personnel, RG, TG, EM, JR Date: 06/29 - 30/88
(Note: All Weights in pounds, unless other wise noted) Recycle #2

Soil Weight Added: 200.0lb Percent Moisture: 22.1%

Reagent Recycled from Previous Reaction			Makeup Reagents to original concentrations	
Chemicals	Liquids	Solids		
KOH	0.9		KOH(dry)	17
PEG	12.3		PEG	11
TMH	8.9		TMH	11
DMSO	12.6		DMSO	22
Water	27.3			
Total	62			
Total, w/Makeup				123

Reactor RPM 50

REACTION

	Reactor		Steam Generator		PCB Conc, ppm	
Time	Amps	Temp, °C	Amps	Press, psig	Wet	Dry
start 0855	10	36				73.2
1000	9	96	80	30		70.9
1100	9.5	126	60	120		57.5
1200	10	127	70	120		40.2
1300	9.5	136	60	120		24.6
1400	9.5	140	50	120		11
1500	9	149	<50	95		5.2
1600	9	148	<50	75		3.3
					Final soil	2.5

Turn off steam generator, time: 1645
Temp before adding KOH solution water back to reactor: 146°C Time: 1645
Temp after adding water back to reactor: 104°C
Time, stop mixing: 1735

Notes: 1700: Reactor cooled to approximately 90°C with pumping water through steam jacket, after solution water added back.

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	51.5	51.5	286.5
Final Weight	133	51.5	289
Lbs. gained	81.5	0	2.5 (scale tol.)
Weight after solution water	133		
Lbs. gained	0		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	*Wash #1	*Wash #1&2	*Wash#2&3	*W#3,frsh		
Water Added	90.5	20 Wash#1 100 Wash#2	22 Wash#2 99 Wash#3	20 Wash#3 100.5 fresh		
Mix Time		35 min.	60 min.	60 min.		
Liquid or Mass recovered	58	110.5	135.5	129	192.5	81.5
KOH	0.4	3.8	3.3	1.7	3.2	0.2
PEG	10.2	8.7	4.1	2.8	1.2	0.2
TMH	7.9	6.2	4.3	1.9	1.3	1.5
DMSO	11.8	9.8	6.6	3	1.4	8.1
Soil recovered	153	215.5	168	192.5		
Soil lost	0	7	2.5	0		
				%Moisture	32.00%	
Solids recovered sm. centrifuge	0.5	0.5	1.5			

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
KOH	2.4		2.4
PEG	14.3		14.3
TMH	20.8		20.8
DMSO	24.7		24.7
Water	42.3		42.5
Total	104.5		104.5

Notes: *Washes are from Reaction #4, an attempt to get reagents back into recycle chain.

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 6 Site Personnel, RG, TG, EM, JR Date: 07/10 - 13/88
(Note: All Weights in pounds, unless other wise noted) Recycle #3

Soil Weight Added: 200.0lb Percent Moisture: 18.8%

Reagent Recycled from Previous Reaction			Makeup Reagents to original concentrations	
Chemicals	Liquids	Solids		
KOH	2.4		KOH(dry)	15.5
PEG	14.3		PEG	5.5
TMH	20.8		TMH	0
DMSO	24.7		DMSO	16
Water	42.3			
Total	104.5			
Total, w/Makeup				141.5

Reactor RPM 50

REACTION

		Reactor		Steam Generator		PCB Conc, ppm		
Time		Amps	Temp, °C	Amps	Press, psig	Wet	Dry	
start	0920						83	
start	1010		25					
1100		9	80	50	15		121	
1200		9	112	60	40		55.3	
1300		9	124	75	65		-	(vial broke)
1400		9	130	65	30		11	
1500		9	150	50	85		4.8	
1600		9	149	50	70			
						Final soil	2.7	

Turn off steam generator, time: 1600
Temp before adding KOH solution water back to reactor: 138°C Time: 1630
Temp after adding water back to reactor: 105°C
Time, stop mixing: 1700

Notes: * Reaction interrupted by diesel generator problems on 07/10.
Finally restarted 07/11/88, after sitting unheated overnight.

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	51.5	52	289
Final Weight	127	52	289
Lbs. gained	75.5	0	0
Weight after solution water	128.5		
Lbs. gained	1.5		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	*Wash#3	fresh	fresh		
Water Added	89	119.5	119	116		
Mix Time		40 min.	65 min.	60 min.		
Liquid or Mass recovered	88	132	126	125	209	77
KOH	1.2	5.5	3	1.4	3.4	0.2
PEG	7.7	2.7	1.5	1	2.3	0.1
TMH	6.4	4	1	0.75	0.6	0.5
DMSO	13.7	7.4	1.5	1.5	1	8.5
Soil recovered	83	185	165	209		
Soil lost	2	2	0	-3.5		
				%Moisture	44.90%	
Solids recovered sm. centrifuge	0	2	0			

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
KOH	0.8		0.8
PEG	18.1		18.1
TMH	21.6		21.6
DMSO	37.4		37.4
Water	38.6		38.6
Total	116.5		116.5

Notes: *Washes are from Reaction #5.

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 7 Site Personnel, RG, TG, EM, JR Date: 07/14 - 120/88
(Note: All Weights in pounds, unless other wise noted) Recycle #4

Soil Weight Added: 200.0lb Percent Moisture: 22.1%

Reagent Recycled from Previous Reaction

Chemicals	Liquids	Solids
KOH	0.8	
PEG	17.9	
TMH	21.4	
DMSO	37	
Water	38.4	
Total	115.5	

Makeup Reagents to original concentrations

KOH(dry)	17
PEG	2
TMH	0
DMSO	3

Total, w/Makeup 137.5

Reactor RPM 50

REACTION

Time	Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry	
start 0745		54				109	
O900		113	50	30		43.6	
1000	9	119	60	35		67.8	
1100	9	128	70	52		26.3	
1200	9	>150	<50	90		4.7	(vial broke)
1300	9	150	0	60		1.1	

Final soil 1.7

Turn off steam generator, time: 1320
Temp before adding KOH solution water back to reactor: 145° Time: 1330
Temp after adding water back to reactor: 106°C
Time, stop mixing: 1430

Notes: * Reaction interrupted by diesel generator problems on 07/10.
Finally restarted 07/11/88, after sitting unheated overnight.

	Cond. Drum #1	Cond.Drum #2		Nixtox Drum
Initital Weight	52	51.5		289
Final Weight	126.5	52		289
Lbs. gained	74.5	0.5	(scale toleranc	0
Weight after solution water	128			
Lbs. gained	1.5			

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	*Wash2&3	*Wash3/fresh	fresh	fresh		
Water Added	23Wash2 64.5Wash3	56Wash#3 58.5 fresh	116	121		
Mix Time		45 min.	60 min.	30 min.		
Liquid or Mass recovered	†170	145.5	139.5	135.5	158.5	†
KOH	0.9	7	3.1	1.5	1.2	†
^PEG	24.2	11.2	4.4	1.6	0.7	†
TMH	10	4.5	1.8	0.8	0.3	†
DMSO	27.7	5.7	2.6	1.1	0.6	†
Soil recovered	32	124	85	158.5		
Soil lost	1	3	0	-3		
				%Moisture	25.80%	
Solids recovered sm. centrifuge		5.5	0			

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs		Total, Lbs.
KOH	4.8			4.8
PEG	18.1			18.1
TMH	10.3			10.3
DMSO	24			24
Water	42.3	4.5	(not analyzed)	46.8
Total	99.5	4.5		104

Notes: *Washes are from Reaction #6.
†Reagent and condensate mixed on this reaction.
^PEG recovery so high because mechanical seal leaking PEG into reactor

Run # 8 Site Personnel, RG, TG, JR Date: 08/11 - 13/88
(Note: All Weights in pounds, unless other wise noted) Recycle #5

Soil Weight Added: 200.0lb Percent Moisture: 20.3%

Reagent Recycled from Previous Reaction — Makeup Reagents to original concentrations

Chemicals	Liquids	Solids		Makeup	
KOH	4.8			KOH(dry)	13
PEG	18.1			PEG	2
TMH	10.3			TMH	9.5
DMSO	24			DMSO	16
Water	42.3	4.5	(not analyzed)		
Total		104.5			
Total, w/Makeup					144.5

Reactor RPM 50

REACTION

Time	Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry
start 0935	9	33				78
1100	8	97	<50	10		21
1200	8	113	<50	22		50
1300	9	117	50	35		23
1400	9	125	65	55		14
1500	9	145	<50	80		9.9
1600	8.5	150	<50	82		5.7
					Final soil	3

Turn off steam generator, time: 1630
Temp before adding KOH solution water back to reactor: 146°C Time: 1655
Temp after adding water back to reactor: 116°C
Time, stop mixing: 1730

Notes: * Reaction interrupted by diesel generator problems on 07/10. Finally restarted 07/11/88, after sitting unheated overnight.

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	53	52.5	287
Final Weight	113	52.5	287
Lbs. gained	60	0	0
Weight after solution water	117		
Lbs. gained	4		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	*Wash3	fresh	fresh		
Water Added	72	123.5	116	113.5		
Mix Time		30 min.	30 min.	30 min.		
Liquid or Mass recovered	127	131.5	127	127	180	64.†
KOH	1.1	3.9	2	1.3	2.3	0.1
^PEG	14.6	9.3	5.1	2.7	0	0.2
TMH	7.2	4.7	2.8	1.2	0.3	0.3
DMSO	14.4	8.8	3.7	1.5	0.8	8.1
Soil recovered	141.5	145	125.5	180		
Soil lost	1	0.5	-1	0.5		
				%Moisture	41.00%	
Solids recovered sm. centrifuge		5.5	0	Centrifuge motor seized.		

REAGENT DISTILLATION

	Liquids, Lbs		Solids, Lbs		Total, Lbs.
KOH	0.3		3.4		3.7
PEG	25.7		7.7		33.4
TMH	9.9		3.9		13.8
DMSO	28.8		11.7		40.5
Water	7.8	(unknown)	40.1	(unk. & water	47.9
Total	72.5		4.5		139

Notes: *Washes are from Reaction #7.
†Reagent and condensate mixed on this reaction.
^PEG recovery so high because mechanical seal leaking PEG into reactor

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 9 Site Personnel, RG, TG, JR Date: 08/15 -17/88
(Note: All Weights in pounds, unless other wise noted) Recycle #6

Soil Weight Added: 201.0lb Percent Moisture: 26.0%%

Reagent Recycled from Previous Reaction				Makeup Reagents to original concentrations	
Chemicals	Liquids	Solids			
KOH	0.3	3.4		KOH(dry)	14.5
PEG	25.7	7.7		PEG	0
TMH	9.9	3.9		TMH	6
DMSO	28.8	11.7		DMSO	0
Water	7.8	40.1	(unknown)		
Total		139.3			
Total, w/Makeup					159.8

Reactor RPM 50

REACTION

Time	Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry
start 0745	9.5	43				86
O900	9	101	55	22		24
1000	8.5	113	65	40		33
1100	8.5	127	85	68		22
1200	8.5	150	<50	85		10
1300	8.5	149	0	70		(unable to sample)
1400						
				Final soil		5.7

Turn off steam generator, time: 1330
Temp before adding KOH solution water back to reactor: 130°CC Time: 1355
Temp after adding water back to reactor: 110°C
Time, stop mixing: 1440

Notes:

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	53	52.5	287
Final Weight	113	52.5	287
Lbs. gained	60	0	0
Weight after solution water	117		
Lbs. gained	4		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	*Wash3	fresh	fresh		
Water Added	101	127	111	115.5		
Mix Time		30 min.	30 min.	30 min.		
Liquid or Mass recovered	104	139	119.5	120	221.5	83
KOH	117	5.6	2.4	1.3	4.1	0.2
^PEG	18.2	7	3	2	0.6	0
TMH	13.8	4.4	1.8	1.3	0.3	1
DMSO	13.7	6.1	2.5	1.3	0.4	10
Soil recovered	177	184	140	221.5		
Soil lost	2	1.5	-3	0		
				%Moisture	46.90%	
Solids recovered sm. centrifuge		5.5	0	Centrifuge not repaired yet.		

REAGENT DISTILLATION

	Liquids, Lbs		Solids, Lbs		Total, Lbs.
KOH	5.2		2.4		7.6
PEG	21.7		1.2		22.9
TMH	17.7		1.6		19.3
DMSO	27.9		0.8		28.7
Water	71.5	(unknown)	25	(unk. & water	96.5
Total	144		31		175

Notes: *Washes are from Reaction #8.

Galson Research Corp. Run Sheet, Wide Beach Pilot Test

Run # 10 Site Personnel, RG, TG, JR Date: 08/18 -19/88
(Note: All Weights in pounds, unless other wise noted) Recycle #7

Soil Weight Added: 200.0lb Percent Moisture: 24.1%%

Reagent Recycled from Previous Reaction				Makeup Reagents to original concentrations	
Chemicals	Liquids	Solids			
KOH	5.2	2.4		KOH(dry)	11.5
PEG	21.7	1.2		PEG	0
TMH	17.7	1.6		TMH	0.5
DMSO	27.9	0.8		DMSO	11.5
Water	71.5	25	(unknown)		
Total		175			
Total, w/Makeup					198.5

Reactor RPM 50

REACTION

Time		Reactor Amps	Reactor Temp, °C	Steam Generator Amps	Steam Generator Press, psig	PCB Conc, ppm Wet	PCB Conc, ppm Dry
start	0730	9.5	36				79
0900		9	111	85	50		66
1000		9	122	110	95		56
1100		8.5	145	<50	115		18
1200		8.5	149	<50	76		14
1300		8.5	150	<50	77		7.8
1400							7.9
						Final soil	2.4

Turn off steam generator, time: 1400
Temp before adding KOH solution water back to reactor: 145°C Time: 1415
Temp after adding water back to reactor: 110°C
Time, stop mixing: 1500

Notes:

	Cond. Drum #1	Cond.Drum #2	Nixtox Drum
Initital Weight	54	52.5	287
Final Weight	182	52.5	287
Lbs. gained	128	0	0
Weight after solution water	183.5		
Lbs. gained	1.5		

REAGENT RECOVERY LARGE CENTRIFUGE (approx. 500 Gs)

	Reagent	Wash #1	Wash #2	Wash #3	Final Soil After Washes (solids)	Condensate (Liquids)
Water Source	fresh	*Wash3	fresh	fresh		
Water Added	129.5	114	111	115.5		
Mix Time		30 min.	30 min.	30 min.		
Liquid or Mass recovered	125	136	110.5	120	147.5	129.5
KOH	2.9	3.9	1.6	0.7	2	0.5
^PEG	19.1	7.8	2.9	1.7	0.7	1.6
TMH	9.1	4.1	1.4	1.1	0.2	2.5
DMSO	14.3	6.3	2.1	1.1	0.4	14.9
Soil recovered	153.5	153	123	147.5		
Soil lost	2	0.5	-2.5	1		
				%Moisture	41.20%	
Solids recovered sm. centrifuge				Centrifuge not repaired yet.		

REAGENT DISTILLATION

	Liquids, Lbs	Solids, Lbs	Total, Lbs.
KOH			
PEG			Last run, no distillation
TMH			
DMSO			
Water	(unknown)	(unk. & water)	
Total			

Notes: *Washes are from Reaction #9.
Took sample of slurry for centrifuge tests at Bird Centrifuge, 52.0 lb taken directly from reactor, after washing steps.