POC-SCALE TESTING OF OIL AGGLOMERATION TECHNIQUES
AND EQUIPMENT FOR FINE COAL PROCESSING

10

Appendixes

POC-Scale Equipment Design, Installation, Start-up
and Maintenance Manual

RECEIVED
MAY 31 2000
OSTI

Principal Investigators

W. Pawlak
K. Szymocha

ACQUISITION & ASSISTANCE
1999 DEC -2 A 11: 10
USDOE-FETC

Work Performed Under Contract No. ^E~~DQ~~-A^F22-95PC95152

Prepared by
Alberta Research Council
Environmental Technologies
250 Karl Clark Road
Edmonton, Alberta
Canada T6N 1E4

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Appendix 1

1. Float-Sink Separation

1.1 Float-Sink Apparatus

The centrifugal float-sink tests are carried out using the apparatus shown in Figure A-1. This apparatus has been made based on the method developed and described by J.P. Franzidis and M.C. Harris*. This equipment has been devised for speeding up float-sink analysis of coal fines. The float-sink device consists of two chambers:

- outside chamber – a standard stainless 250mL centrifugation tube, and
- inside chamber – a stainless steel custom made to fit centrifugation tube

The inside chamber is a tapered tube with the bottom sealed by a conical plug. This plug is connected via a rod to a spring at the top of the chamber. When sufficient downward forces act on the plug, the spring is compressed just opening the bottom of the chamber. At the beginning of the float-sink test the coal-solvent slurry remain in the inside chamber of the apparatus. The outside chamber is filled with the same solvent and the fluid level is the same as in the inside chamber and enables sink material to enter the outside chamber. During spinning, at certain value rpm, the centrifugal force acting on the conical plug pulls it down just compressing the spring. This links the fluid in the inside chamber with that in the outside chamber. When the separation is completed and rpm is reduced, the downward force decrease and the conical plug seals the inside chamber isolating the float material from the sink material.

*J.P. Franzidis and M.C. Harris, "A Method for the Rapid Float-Sink Analysis of Coal Fines", *J.S. Afr. Inst. Min. Metallo.*, Vol. 86 No. 10, Oct 1986, pp409-414.

1.2 Centrifugal Float-Sink Experimental Procedure

1. Wet screen coal fines samples into three size fractions: +500 μm , 500 μm x 150 μm and 150 μm x 0.
2. Dry the coal size fractions in a convention oven, which is set at 105°C for 3 hours to achieve a moisture content of essentially 0%. Place the samples in a desicator.
3. Weigh 2 g of coal sample, using analytical balance into 100 mL Erlenmeyer flask with \$ topper, add 50 mL of solvent with required density and shake for 20 min at 216 rpm on a shaker.
4. Ultrasonically condition the coal-solvent slurry for 10 min.
5. Transfer the content of the flask into inside chamber of the float-sink apparatus using small funnel; wash out the content of the flask with additional 44 mL of the solvent.
6. Add 121 mL of the solvent into outside chamber of the float/sink apparatus.
7. Do everything in duplicate.
8. Equalize the weight of both apparatus before centirifugation using the same solvent.
9. Place both apparatus into centrifuge and centrifugate 15 min at 1000 rpm and 10 min at 1300 rpm.
10. Filtrate the content of inside and outside chamber separately using Whatman paper No. 40 or 42 and wash out all the content carefully.
11. Dry filter papers in vacuum oven at 60°C to a constant weight.
12. Subject dry float and sink fraction for analysis.

A) 1000 RPM
the Inside chamber
remains closed

B) 1300 RPM
the spring is compressed
and the bottom of the inside
chamber is open

Figure A-1. Float-Sink Apparatus

1 - Outside chamber, 2 - Inside chamber,
3 - Conical plug and rod, 4 - Spring

A-2. Batch-Scale Test Procedure

Experiments are performed in a 1L mixer equipped with variable speed stirrer. The tank contains four removable baffles. Radial four-blade, turbine type impeller on centrally located shaft provides agitation. Detailed data on high-shear mixer geometry is shown in Figure A-2.

Recovery of clean coal flocs is performed in a standard Denver flotation machine model D-12 equipped with a 2.5L flotation cell.

In a typical experiment, a weighed coal fines sample is placed in the stirrer tank and mixed with water to make up the required solids concentration. The resulting suspension is mixed at 1750 rpm and a predicted amount of bridging liquid (0.5% to 3%) is added. Bridging liquid (usually oil) is introduced to the coal slurry without emulsification. The slurry is agitated for a predetermined period of time, then transferred to the flotation cell and diluted. The volume of slurry is adjusted by adding water to achieve 6% to 10% solids concentration. The frother (when used) is added to the slurry and the slurry is conditioned for 60 seconds. The agitation rate is set at 1100 rpm and then air applied to the cell. Coal microagglomerates (flocs) are manually removed for six minutes.

Subsequently, the coal concentrate is dried at 40°C, weighed and analyzed for proximate composition and total sulfur (optional). For selected samples, if necessary, forms of sulfur and calorific values are also determined.

The tailings are filtered, weighed and analyzed for ash.

Figure A-2. Laboratory High-Shear Mixer.

A-3. POC-Scale Mixer and Jet Processor

For purpose of POC-scale tests a mixer as shown in Figure A-3 was designed. The mixer tank volume is 0.9 m^3 , and power demand required for slurry mixing to achieve micro-agglomeration is in the order of 20 kW.

Figure A-3. POC size turbine mixer with tank volume of 0.9 m^3 .

The jet processor operation relies on oil dispersion and oil-water emulsion formation. The emulsion is injected under large pressure into the coal slurry stream. Resulted interaction between the atomized oil droplets and coal particles in mixing zone of the injected stream are responsible for fast slurry conditioning process. Oil emulsification and injection consumes significantly less energy as compared to high-shear mixer. The jet processor is shown in Figure A-4.

Figure A-4. POC- scale jet processor.

4. Analytical Procedures and Standards

Proximate Analysis:	Fisher Coal Analyzer (ASTM draft stage) ASTM D3174-93 and D3175-89a (Reapproved 1993)
Total Sulfur Analysis:	Leco SC-32 ASTM D 4239-85 High temperature combustion method with IR absorption procedure
Forms of Sulfur :	ASTM D 2492 (SO ₄ → S ICP) (Pyrite → Fe ICP)
Calorific Value:	ASTM D 2015
Particle Size Distribution:	Granulometer 723 (Laser Light Diffraction) or wet screening

The following laboratories provide analytical services for this project:

- Analytical Laboratory of National Centre for Upgrading Technology (NCUT), Devon Research Centre, 1 Oil Patch Drive, Devon, Alberta
- Norwest Labs, 14203- 129 Avenue, Edmonton, Alberta

Appendix 2

SECTION I: GENERAL DESCRIPTION

1.0 INTRODUCTION

The information presented in this manual is solely for the purpose of operating the POC-scale equipment for fine coal processing as described herein. This manual provides a general description of the process technology and guidelines for plant operating procedures. It is intended for use by the operators and maintenance personnel who will be responsible for the operations of the plant.

No attempt should be made to operate the plant until the principles of the process and operating instructions contained in this manual are fully understood. Operating personnel should thoroughly familiarize themselves with all processing equipment prior to commencing plant operation. All equipment is skid mounted to provide a self-contained unit. The dimensions of the unit are comply with standard guidelines. A minimum distance of 2 feet is provided between equipment for walkway and maintenance.

2.0 PRINCIPLES OF THE AGLOFLOAT TECHNOLOGY

The Aglofloat® process is an oil agglomeration based technology that can be applied particularly successfully for coal fines below 150 μm (100M). Low oil addition levels (in the range of 0.1-2.5% by coal weight) combined with exceptional selectivity place the Aglofloat® process in the forefront of technologies for fine coal cleanup and recovery. The performance of this process depends on the degree of liberation of the mineral matter from the coal matrix during comminution. The separation takes place as a result of vigorous agitation of fine coal suspended in water in the presence of oil. Hydrophilic mineral matter particles become completely wetted with water. The hydrophobic coal particles are in turn coated with the oil and due to its surface tension undergo aggregation initially forming flocs and subsequently, depending on the amount of oil, forming microagglomerates or agglomerates. Four steps can be distinguished in the oil agglomeration process.

- Conditioning (wetting) mineral matter particles with water
- Emulsification of oil
- Coating of coal particles with oil
- Aggregation of oil coated coal particles into flocs and, subsequent microagglomerates

Initially, stirred tank systems were utilized for carrying out these four steps as well as to form agglomerates. Work carried out by ARC has shown that when recovery of fine coal is the key objective of the agglomeration process the cumbersome stirred tank system can be replaced with one high-shear mixer or jet processor. The microagglomerated coal generated in the high-shear agitator or jet processor can be efficiently recovered using

conventional flotation. The liberated inorganic components (impurities) of coal like pyrite, other mineral particles and trace elements remain suspended in water. Up to 90% of most of the inorganic constituents, 80% of pyrite and based on the results of recent experimental work, up to 50-90% of trace elements can be removed from coal by this approach and further progress in this area seems quite possible.

3.0 PROCESS DESCRIPTION

The following is a description of the POC-scale Aglofloat plant.

Note: The reader should reference to the Drawing Number 9038-0190-101 (in Appendix A) and Figures 3-1, 3-2 and 3-3

The POC-scale unit is designed for a nominal throughput of 3 t/hr of dry coal fines. The continuous operation plant is capable of being operated on a short daily schedules or longer 24 hr/day basis.

During the course of work on the conceptual design and engineering of the POC-scale system three process flow diagrams were developed:

- Case A - cyclone overflow without densification used as a plant feed
- Case B - cyclone overflow densified to solids concentration of about 20% used as a plant feed
- Case C - coal slurry prepared from pond fines used as a plant feed

Case A

Slip stream of coal fines slurry from cyclones overflow is pumped directly to the high-shear mixer and/or jet processor. A known amount of bridging oil is continuously added to high-shear mixer or to jet processor. When a high-shear mixer is used as conditioning device, both bridging oil and frother are added to coal slurry prior it enters the high-shear mixer. When jet processor is utilized, bridging oil and frother are introduced into the centre of coal slurry pipe via especially designed injection system. After conditioning the coal microagglomerates slurry is transferred to the flotation cell for combustible matter recovery. Because of the space limitation and some technical problems, the POC-scale module flotation cell is smaller (0.25 to 0.50 t/hr) than originally planned throughout. To accommodate this change, only part of the conditioned coal slurry is taken to the flotation cell. The excess of processed slurry is by-passing the flotation system and directed back to the Shoal Creek Mine preparation plant system. After flotation and sampling, both streams (coal concentrate and tailings) are directed to Drummond coal preparation plant.

Case B

The process configuration is similar to Case A except of coal fines slurry concentration. Prior to entering a conditioning stage, cyclones overflow from slurry splitter box is directed to the slurry densifier in order to increase the slurry solids concentration to the

level of 15% to 20%. After densification the next process steps are the same as described above.

Case C

In this process configuration, the pond fines are used for coal slurry preparation.

The feed coal is received from the settling pond by truck and after loading into mixing tank (Case B slurry densifier) is diluted with water to obtain required solids concentration. After slurry preparation, the next process steps are the same as described for the Case A.

Figure A3-1. Simplified Flow Diagram of the Aglofloat POC-Scale Unit - Case A.

Figure A3-3. Simplified Flow Diagram of the Aglofloat POC-Scale Unit
Case C - Settling Pond Fines Treatment.

3.1 Plant Layout

The 3 t/h coal preparation equipment is constructed as a self-contained, skid-mounted unit. The skid-mounted module is transported on trailers and requires partial assembly at the site. The layout of the plant is shown in Figure 9038-0190-101 (see Appendix) The plant is supposed to be located on the second floor of the Drummond Shoal Creek Mine coal preparation plant as shown in the Figure 4. The footprint of the coal preparation plant is approximately 10 by 3 m (32'-10" by 4'-11").

The plant equipment is going to be located between Deslime Sieve Bends and Clean Coal Sieve Bend, not to far from Conditioning Tank.

The thickener V-160 is located next to the coal slurry flotation feed line for allowing an easy access for feeding the thickener. The slurry tanks V-140 and V-145 are located in vicinity of the Conditioning Tank and provide convenient access for slurry discharge to the existing plant Conditioning Tank and are connected by flexible piping. The design of the plant minimizes the overall space requirements enforced by available space on the second (elevation 454') floor of the Drummond coal preparation plant.

Figure A4.1 Layout of the Coal Preparation Plant.

3.2 Equipment Schedule

Equipment schedule and assemble drawing for skid-mounted POC-scale agglomeration plant is listed in Table 1 below and Drawing 9038-0190-101 (Appendix A).

Table 1. List of Equipment

Equipment	Make or Model	Tag	Reference Drawing Number
Water Storage Tank	VESTEEL	V-110	9038-0190-001
Oil Storage Tank	VESTEEL	V-115	9038-0190-001
Frother Tank	Plastic container	V-120	9038-0190-001
High-Shear Mixer	TDE Fabricated	V-140	9038-0190-002
Slurry Tank	TDE Fabricated	V-145	9038-0190-002
Thickener	TDE Fabricated	V-160	9038-0190-001
Flotation Cell	Denver	V-170	9038-0190-002
Jet Processor	TDE Fabricated	M-105	9038-0190-002
Slurry Transfer Pump	ITT/A-C Pump	P-100	9038-0190-001
Injection Pump		P-125	9038-0190-001
Oil Pump	Bran & Lubbe	P-130	9038-0190-001
Frother Pump	Bran & Lubbe	P-135	9038-0190-001
Slurry Transfer Pump	ITT/A-CPUMP	P-150	9038-0190-002
Slurry Transfer Pump	SALA	P-155	9038-0190-021

3.3 Control System

Drawings 9038-0190-001 and 9038-0190-002 (see Appendix) show a schematic configuration of the process control system. The plant is designed to operate under semi-automated control and require only infrequent operator action. Plant configuration setting, start-up and shut-down require operator manual input. All pumps are equipped with auto/off switches. In auto mode pumps are under control as indicated by the cause and effect diagram (see Table in Appendix).

Processing parameters that are monitored and controlled are; slurries and process water flow rates, oil flow rate, tank levels and pumping pressures.

The controllers are single loop with local indication that displays current process values. The list of instruments along with a description of their functions is given in Table 2.

Table 2. Preparation Plant Control Element Description

Instrument Tag #	Instrument Description	Application	Control Action	Alarm
FIT-100, PI-100	Magnetic Flowmeter Burbon Tube Gauge	Flow rate indicator/control Pressure indicator	Adjust speed of pump P-100	none none
FIT- 105 FY-105 FCV-105	Magnetic Flowmeter Electric/Pnuematic Transducer Butterfly Valve with pneumatic acutator	Flow rate control Valve acctivation Flow rate cotnrol	Adjust control valve FCV-105 Adjust control valve FCV-105	none none none
LCV-120 LSH-120 LSL-120	2 Way Pilot Operated Electric Selenoid Valve Electric Level Switch Electric Level Switch	Adjust make-up water control valve Level detector - V-110 water tank Level detector - V-110 water tank	Adjust make-up water supplay Close control valve LCV-120 Open control valve LCV-120	none none none
FI/FQI-125 PI-125	Turbine Flow Meter Burbon Tube Gauge	Flow rate control High pressure gauge	None None	none none
FI/FQI-130	Turbine Flow Meter	Oil flow rate indicator	None	none
LI-140 LSH-141 LSH-142 LIT-143	Fabricated Sight Indicator Electric Level Switch Electric Level Switch Level Indicator	Level indicator Level control Level control Level indicator/control	None None None Adjust speed of pump P-150	none HLA LLA none
FIT-145 LI-145 FIT-146 LSH-146 LSL-147 LIT-148	Magnetic Flowmeter Fabricated Sight Indicator Magnetic Flowmeter Electric Level Switch Electric Level Switch Level Indicator	Tailings flow rate local readout Level indicator Product slury flow rate local readout Level control Level control Level control	None None None None None Adjust speed of pump P-155	none none none HLA LLA none
PI-150	Burbon Tube Gauge	Pressure indicator	None	none
PI-155	Burbon Tube Gauge	Pressure indicator	None	none
FIT-160 LI-160 FIT-161 FY-161 FCV-161 LSH-161 LSL-162	Magnetic Flowmeter Fabricated Sight Indicator Magnetic Flowmeter Electric/Pnuematic Transducer Butterfly Valve with pneumatic acutator Electric Level Switch Electric Level Switch	Flow rate indicator/control Level indicator Flow rate indicator/control Valve acctivation Flow rate control Level control Level control	Adjust speed of pump P-165 Adjust control valve FCV-161 Adjust control valve FCF-161 None None	none none none none none HLA LLA
PI-165	Burbon Tube Gauge	Pressure indicator	None	

HLA - High Level Alarm, LLA - Low Level Alarm,

SECTION II: OPERATING INSTRUCTIONS

1.0 TRAINING

The personnel who will be responsible for operating the plant have prior operating experience on similar types of plants. However before initial plant start-up, operators should take time to familiarize themselves with the plant equipment, and this operation manual and manuals provided by equipment producers. A set of equipment manuals should be kept at the plant at all times.

2.0 PRIOR START-UP INSPECTION

Prior to each scheduled plant start up, the following routine check of the plant should be made.

- Ensure all hoses and electrical cables are properly connected. Repair or replace damaged hoses and cables.
- Check all drive belts on pumps, for proper tension.
- Check supply of bridging oil and frother. Refill if necessary.
- Be sure that an operation log is prepared. The log should indicate what process conditions are to be run on the plant.

3.0 PLANT START-UP PROCEDURE

3.1 Prior Start Up Preparation

1. Ensure that all drain valves from all vessels to common header are closed and that all breakers at the motor control centre (MCC Panel) are off.
2. Turn main power switch on at the motor control centre to energize the plant.
3. Fill tank V-110 with water and set for automatic level control.
4. Fill tank V-115 with oil feedstock.
5. Fill tank V-120 with frother feedstock.
6. Configure all valves on slurry lines, vessel discharges and pump discharges according to the desired mode of operation (ie-different configuration depending on operation of jet processor or high-shear mixer).

3.2 Jet Processor Mode

1. If thickener V-160 is being used, open coal slurry supply valve and start pump P-100 to feed coal slurry to thickener. Begin filling thickener and start thickener mixer.

2. While thickener is filling, open jet processor M-105 valve, start injection pump P-125 to feed jet processor M-105 at desired flowrate.
3. Set oil flowrate and start P-130 oil injection to M-105 jet processor.
4. Set frother flowrate and start P-135 frother injection to M-105 jet processor.
5. Once tank V-160 is half full and flows of water, oil and frother are all established, open valve before pump P-165, start pump P-165 and send slurry thorough jet processor.
6. Start mixers on tank V-170 as slurry begins to fill the flotation cells.
7. When froth and tailings begin filling into tank V-145, start pump P-155 to discharge to common return header.
8. If thickener is not being used, establish flows of water, oil and frother injection thru jet processor and then open coal slurry supply valve to start slurry flow thru jet processor. Proceed with steps 6 & 7.

3.3 High- Shear Mixer Mode

1. If thickener V-160 is being used, open coal slurry supply valve and start pump P-100 to feed coal slurry to thickener. Begin filling thickener and start thickener mixer.
2. Set oil flowrate and start pump P-130 oil feeding to high-shear mixer V-140.
3. Set frother flowrate and start pump P-135 frother feeding to high-shear mixer V-140.
4. Once flows of oil and frother are established, open valve before pump P-165, start pump P-165 and send slurry to high-shear mixer. Start mixer V-140.
5. When operating level of slurry is established in high-shear mixer, start pump P-150 to feed slurry to flotation cells V-170.
6. Repeat steps 6, 7, & 8 of Jet Processor Mode operation.

4.0 PLANT MONITORING AND CONTROL

With the plant up and running, operators must maintain a strict routine for monitoring the process. Control point adjustments may be required periodically to keep the plant within the desired processing parameters

The following are recommended checkpoints:

- Monitor flow meter readings, watching for signs of erratic flow, indicating a potential plug in a slurry line.
- Watch for erratic equipment behaviour. Stop operations immediately if any equipment is malfunctioning.
- Record all required operating parameters (tonnages, flow rates, water and power meter readings) on a regular basis.

- Maintain a daily log book to record daily plant activities (start-up time, operating time, shut-down time, down time, etc)
- Collect and analyze plant samples as specified. The results of these analysis are required to check that the plant operating parameters are maintained according to plan. Operators will be instructed on how to collect, analyze and keep records of the results.
- A record of analytical results should be maintained and updated regularly so that the plant performance can be assessed.

5.0 PLANT SHUT-DOWN PROCEDURE

The following is the recommended plant shut-down procedure.

1. Close coal slurry valve and immediately start water flow through coal slurry supply line.
2. Stop oil and frother pumps, P-130 and P-135.
3. Stop -125 water injection pump if using the jet processor.
4. Allow water flow thorough the entire system until there is no froth in flotation cells V-170.
5. Make sure all lines and pumps are clear from coal slurry.
6. Stop water flow, stop all pumps and isolate all vessels by closing discharge hand valves.
7. Open all drain valves on vessels to common drain header except for oil feedstock tank V-115 and frother feedstock V-120.
8. Stop all mixers.
9. Wash down inside walls of slurry tank V-145, thickener V-160, and flotation cells V-170 and let it drain to the common drain header.
10. Switch off all breakers at the motor control centre (MCC Panel).
11. Switch off main disconnect switch at the MCC Panel to de-energize the entire plant.

6.0 PLANT DISMANTLING AND TRANSPORTATION

When the demonstration of POC-scale equipment at the Shoal Creek Mine preparation plant is complete, the plant shall be decommissioned and prepared for removal from the site as follows:

- drain all water from the plant and clean all equipment
- return all chemicals/reagents to approved transport containers
- re-install all transport retainers on equipment according to manufacturer recommendations
- secure the skid prior to transporting the plant

SECTION III: PLANT INSPECTION AND MAINTENANCE

1.0 GENERAL MAINTENANCE

Operators should conduct routine inspection and general maintenance of the plant equipment.

- Apply lubrication to bearings and drives at manufacturers recommended intervals.
- Inspect piping, flexible hoses and electrical cables.
- Inspect oil and frother reservoirs levels and add if necessary.
- Inspect pump for leakages.

2.0 Manufacturers Recommendations

Major components of the plant namely high-shear mixer, jet processor and densifier will be custom made by Thermo Design Engineering of Edmonton, Alberta, Canada.

It is scheduled to start manufacturing of the equipment at the beginning of August. Manufacturer is obligated to provide Council with recommendation regarding custom made equipment operation and maintenance.

SECTION IV: SAFETY AND HEALTH

1.0 TRAINING REQUIREMENTS

The operation of the plant will fall within regulations governing commercial coal preparation. It is the responsibility of the contractor to ensure that all operators have proper training.

2.0 SITE HEALTH AND SAFETY PLAN

Operation of the POC-scale equipment will comply with all health and safety practices as applicable to the Shoal Creek Mine preparation plant. A Site Health and Safety Plan (HASP) will be prepared in cooperation with Drummond's representative. The (HASP) should be comprehensive, and will inform plant operators on such matters including but not limited to: health and safety responsibilities while on site, required on-site training, emergency protocols, first aid, plan and safety rules, personal protection.

3.0 PERSONAL SAFETY

Operators should recognize that there are inherent safety hazards with this type of plant equipment. Operators should:

- Always be alert and aware of their surroundings.
- Keep hands and feet well clear of rotating machinery.
- Avoid wearing loose clothing that can be easily caught up in moving equipment.
- Never attempt to operate the plant alone.
- Never operate the plant under conditions of poor illumination.
- Always wear appropriate protective outerwear – gloves, coveralls, safety glasses or shields and safety boots.
- Read, understand and follow all site safety procedures.

4.0 CHEMICALS AND REAGENTS

The types of chemicals and reagents used in the question of the plant include:

- Bridging liquids
 - Diesel oil
 - Blends of diesel oil with heavy oil
- Flotation Frother
 - Methyl isobuthyl carbinol (MIBC)

- Alternate to be selected

5.0 CONTACTS AND REPORTING

Operators shall obtain a list of persons to contact in case of health or safety situation should arise. This list should remain posted in a clear and visible location. Operators shall comply with all procedures and practices regarding the reporting if incidents.

APPENDIX A-3

SECTION I

OVERVIEW

SPECIFICATION		DRUMMOND SHOAL CREEK MINE	
THERMO DESIGN ENGINEERING LTD.		AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council	
SECTION I - OVERVIEW This report is intended to provide an engineering guideline for the design and fabrication of the Agfloat Coal Preparation Pilot Plant proposed by the Alberta Research Council in Edmonton, Alberta. This document contains recommended control, electrical and instrumentation systems as well as recommended fabrication designs for vessels not supplied by the Alberta Research Council.			
REFERENCE: 9038-0190 Page 1		PREPARED BY: JRH CHECKED BY: ATR	DATE: 15Jun98 DATE: 15Jun98
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SECTION II

SKID PACKAGING

SPECIFICATION	DRUMMOND SHOAL CREEK MINE		
THERMO DESIGN ENGINEERING LTD.	AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council		

SECTION II - SKID PACKAGING

2.1 GENERAL

All equipment should be skid mounted to provide a self-contained unit.

The dimensions of the unit should comply with standard shipping guidelines.

The bottom of the base support members of the skid shall be level and maintain a flatness with tolerance not exceeding plus or minus 6 mm overall, with closer tolerances being desirable.

A minimum distance of 6096 mm shall be provided between equipment for walkway and maintenance.

2.2 SKID

Skid flooring should be 19 mm oil-field checker plate with continuously welded seal.

Provision should be made for loading and unloading the skid from a truck bed by crane.

Skid load bearing structural members should be full-depth members.

Drip lips should be provided around pumps to minimize spills.

2.3 PIPING

Piping materials should be as per ANSI Code B31.3 for service above -29.4°C.

- Pipe: SA-106-B
- Fittings - BW: SA-234-WPB
- SW / NPT: SA-105
- Flanges: SA-105
- Studs / Nuts: SA-193-B7 / SA-194-2H
- Gaskets: 316 SS Flexitallic

Wall thickness and pipe schedule should be as required for the design pressure except that all pipe 40 mm and smaller should be minimum schedule 80. Piping 40 mm and smaller should be of socket weld or threaded construction, and piping 50 mm and larger for all other services should be of flanged construction.

Process tubing should be 10 mm and instrument tubing should be 15 mm, both cadmium-plated with cadmium plated fittings.

Radiography should be per code (only 5% of all butt welds).

PWHT of piping is not required.

Pipe sizes of 10 mm, 30 mm, 64 mm, 90 mm, 115 mm, 125 mm, 180 mm and 230 mm shall be avoided unless necessary for mating to equipment. When this is necessary, the piping should be immediately enlarged to the next standard size.

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SPECIFICATION	DRUMMOND SHOAL CREEK MINE		
THERMO DESIGN ENGINEERING LTD.	AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council		

Pump suction lines shall be sized and/or elevation shall be determined to provide the required NPSH (Net Positive Suction Head) when pumping at the specified maximum rate for the pump. Pump suction velocities should not exceed 2 m/s.

Pump discharge line velocities shall not exceed the following:

- 100 mm and smaller, 3 m/s
- 150 mm to 300 mm, 4.5 m/s
- 350 mm and larger, 6 m/s

Non-corrosive liquids not being pumped shall have a maximum velocity of 8 m/s.

Corrosive liquids not being pumped shall have a maximum velocity of 1.5 m/s.

Block valves should be provided at the suction and discharge lines of each pump.

2.4 INSULATION

Insulation is not applicable.

2.5 PAINTING

Vessels, structural steel and piping to be painted should be commercially sand blasted to SSPC-SP6 and should receive one coat of primer. Exposed surfaces should be painted with two coats of finish.

2.6 BUILDING

Building is not applicable.

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SECTION III

INSTRUMENTATION DETAILS

SPECIFICATION	DRUMMOND SHOAL CREEK MINE		
THERMO DESIGN ENGINEERING LTD.	AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council		

SECTION III - INSTRUMENTATION DETAILS

3.1 GENERAL

Instrumentation selected by Fabricator should be manufactured to withstand environmental conditions it will be exposed to during normal operation of the facility.

All major instrument items should have a durable metal tag listing item number, size and material, serial number and where applicable, rating or calibrated range.

Each pneumatic instrument should be supplied with an air filter and a reducing valve.

3.2 CONTROL VALVES AND REGULATORS

Actuators should be selected such that the valve fails safe on loss of power. Positioners should be provided for control valves.

Valve trim should be selected to withstand abrasion and chemical attack during normal service. All valves must provide a line of sight flow path.

3.3 FLOW INSTRUMENTS

Flow transmitters in slurry service should be non-obtrusive, full bore to avoid plugging. Flow transmitters in non-slurry service can be of positive displacement type or other suitable design.

All flowmeters should be installed in an orientation to ensure the flowtube is 100% full during normal operation.

All flow transmitters should have local indication and totalizing display.

3.4 PRESSURE INSTRUMENTS

Pressure gauges should have connections to process piping by 50 mm sanitary seal. Pressure gauges should be oil filled.

Pressure instruments should have unit indication in both Imperial and SI measurement.

Pressure gauges should be selected so that the normal operating pressure will be approximately half of the full scale range.

3.5 LEVEL INSTRUMENTS

Level indicators for process vessels should be sight glass windows integral with the vessels and a means must be provided for replacement of glass.

Level switches should be capacitance or inductive type, self-cleaning.

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SPECIFICATION	DRUMMOND SHOAL CREEK MINE
THERMO DESIGN ENGINEERING LTD.	AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council

3.6 INSTRUMENTATION LIST

The following instrument list shows examples of suggested equipment for the skid package but is not intended as a required scope of supply. Instrumentation and types may be substituted based on availability and preferred control scheme.

TAG	EQUIPMENT DESCRIPTION	TYPE	MODEL
P-100	SLURRY TRANSFER PUMP	FIT-100 PI-100	80mm Magnetic Flowmeter, Nema 4x, Local Readout Bourdon Tube Gauge, Liquid Filled, Plastic Case
M-105	JET PROCESSOR	FIT-105 FY-105 FCV-105	15mm Magnetic Flowmeter, Nema 4x, Local Readout Electric/Pneumatic Transducer Butterfly valve with pneumatic actuator
V-110	WATER STORAGE TANK	LCV-120 LSH-120 LSL-120	25mm 2 Way Pilot Operated Electric Solenoid Valve Electric Level Switch, SPDT Electric Level Switch, SPDT
P-125	INJECTION PUMP	PI-125 FI/FQI-125	Bourdon Tube Gauge, Liquid Filled, Plastic Case Turbine Flow Meter, Local Flow and Totalizer
P-130	OIL PUMP	FI-130	Turbine Flow Meter, Local Flow and Totalizer
V-140	HIGH SHEAR MIXER	LI-140 LSH-141 LSL-142 LIT-148	Fabricated Sight Indicator Electric Level Switch, SPDT Electric Level Switch, SPDT Capacitance or inductive, with local indicator
V-145	SLURRY TANK	LI-145 LSH-146 LSL-147 LIT-148 FIT-145 FIT-146	Fabricated Sight Indicator Electric Level Switch, SPDT Electric Level Switch, SPDT Capacitance or inductive, with local indicator 15mm Magnetic Flowmeter, Nema 4x, Local Readout 15mm Magnetic Flowmeter, Nema 4x, Local Readout
P-150	SLURRY TRANSFER PUMP	PI-150	Bourdon Tube Gauge, Liquid Filled, Plastic Case
P-155	SLURRY TRANSFER PUMP	PI-155	Bourdon Tube Gauge, Liquid Filled, Plastic Case
V-160	THICKENER	LI-160 LSH-161 LSL-162 FIT-160 FIT-161 FCV-161	Fabricated Sight Indicator Electric Level Switch, SPDT Electric Level Switch, SPDT 50mm Magnetic Flowmeter, Nema 4x, Local Readout 80mm Magnetic Flowmeter, Nema 4x, Local Readout Butterfly valve with pneumatic actuator
P-165	SLURRY TRANSFER PUMP	PI-165	Bourdon Tube Gauge, Liquid Filled, Plastic Case

SECTION IV

CONTROL SYSTEM

SPECIFICATION		DRUMMOND SHOAL CREEK MINE	
THERMO DESIGN ENGINEERING LTD.		AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council	

SECTION IV - CONTROL SYSTEM

4.1 OVERVIEW

The skid package should contain an independant control system and require only infrequent operator intervention. The control system should be hardwired type.

Overall, the control scheme should be as simplified as possible to allow field modifications by operators.

The cause and effect diagram at the end of this section should be refered too during the discussion of the control system.

4.2 OPERATION

All pumps will be provided with auto / off switches. While in auto mode, pumps will be under control as indicated by the cause and effect diagram. While in off mode, pumps will remain off, bypassing all cause and effect control.

Controllers should be single loop din-mounted type with local indication. VFD's should have integral controllers.

4.3 ALARMS

A general alarm annunciation and acknowledging system should be provided on the skid. This should consist of a horn and flashing inidicator to alert operating personnel.

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Cause and Effect Diagram
Agfloat Coal Preparation Plant

TAG #	CAUSE	EFFECT	9038-0190-001	QL-100	OL-100	P-100	LCV-120	P-165	FCV-161	9038-0190-002	P-150	P-155	FCV-105	Notes
P&ID 9038-0190-001														
LSH-120	Water Storage Tank High Level						C							
LSL-120	Water Storage Tank Low Level						O							
LSH-161	Thickener High Level		X	X										
LSL-162	Thickener Low Level		X	X				Off						
FC-100	Plant Slurry Feed Flow Controller				IND									
FC-160	Thickener Underflow to High Shear Mixer Flow Controller							IND						
FC-161	Thickener Overflow to Flotation Cell Flow Controller								IND					
P&ID 9038-0190-002														
LSH-141	High Shear Mixer Tank High Level		X	X										
LSL-142	High Shear Mixer Tank Low Level		X	X						Off				
LC-143	High Shear Mixer Tank Outlet Flow Controller									DIR				
LSH-146	Slurry Tank High Level		X	X										
LSL-147	Slurry Tank Low Level		X	X							Off			
LC-148	Slurry Tank Outlet Flow Controller											DIR		
FC-105	High Shear Mixer to Flotation Cell Flow Controller												IND	

Key:										General Alarm Status				
☐ O	Open	☐ On	☐ On	☐ DIR	Direct Acting	☐ IND	Indirect Acting	☒ X						
☐ C	Close	☐ Off	☐ Off

SECTION V

ELECTRICAL SYSTEM

SPECIFICATION	DRUMMOND SHOAL CREEK MINE AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council		
THERMO DESIGN ENGINEERING LTD.			

SECTION V - ELECTRICAL SYSTEM

5.1 OVERVIEW

The skid package should be classified Class 1, Division 2. All electrical devices, wiring, conduit, terminals, junction boxes, grounding, control panels, motor control centers and power distribution should be supplied by the Fabricator. The unit should require only main power hookup by local site contractors.

5.2 GENERAL NOTES

All control devices should be rated for 24VDC.

All motors under 370W should be 120V. All motors 370W or larger should be 460V.

Sufficient space should be provided for maintenance personnel to replace components without having to dismantle machinery.

Electrical components such as switches, light fixtures, outlets, control devices, etc. provided by the skid fabricator shall be CSA approved for use in Class 1, Division 2 areas and shall be so labelled.

All control wiring will be minimum 16 gauge.

5.3 ELECTRICAL DEVICES REQUIRED

Lighting should be provided only if the skid location during operation demands additional lighting. If required, lighting fixtures should be Division 2, 175W metal Halide pendant mount, with globe and guard and integral ballasts.

A minimum of two 120V, 20A convenience receptacles should be installed on the skid for maintenance purposes.

5.4 CONDUIT

All conduit should be rigid aluminum.

All conduit should be run in a neat and orderly manner and supported to maintain alignment.

Conduit seals should be installed per CEC and AEPB.

5.5 JUNCTION BOXES

Enclosures mounted on the skid should be EEMAC Type 4, approved for Class 1, Division 2 locations. All conduit run into junction boxes should be bottom entry.

5.6 GROUNDING

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SPECIFICATION	DRUMMOND SHOAL CREEK MINE AGLOFLOAT COAL PREPARATION PLANT Alberta Research Council		
THERMO DESIGN ENGINEERING LTD.			
<p>Each separate piece of equipment should be provided with a grounding point bounded to the equipment meal framework. All electrical components and enclosures should be grounded. There should be no metallic or conductive component insulated from ground.</p> <p>5.7 WIRE INSTALLATION</p> <p>All devices to be connected to an external component should have their connections made at a terminal strip located at the junction box. The terminal strip should be conveniently located for external connections. Terminals should be of screw type.</p> <p>There should be no splices in conduits or tees.</p> <p>All wiring should be tested by the Fabricator prior to shipment to site.</p> <p>5.8 MOTOR CONTROL CENTERS AND SWITCHGEAR</p> <p>The electrical service should have a main disconnect switch capable of de-energinzing the entire plant. The main switch should be able to interrupt the maximum fault current without injury to itself.</p> <p>Motor control centers should be of the dead front, free standing, self-supporting type, complete with three phase bus service and ground bus. The bus bars should be insulated from ground and braced to withstand the maximum fault current that could appear on the system.</p> <p>Push button stations should be provided for and located near all motors.</p> <p>All motors in VFD service should be rated for that service to prevent damage from harmonics.</p>			
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SECTION VI

PROCESS & INSTRUMENTATION DIAGRAMS

NOZZLE SCHEDULE									
MARK	SIZE	QTY	TYPE	RATING	SCH	PROJ	MAT'L	ITEM#	SERVICE
N1	4" [103]	1	RFWN	150#	80				
N2	4" [103]	1	RFWN	150#	80				
N3	4" [103]	1	RFWN	150#	80				

GENERAL NOTES:

1. CODE: ANSI B31.3 96 EDITION & 96 ADDENDA
2. M.A.W.P.: 285 PSIG [1965 kPa]
3. HYDROSTATIC TEST: 427.5 PSIG [2948 kPa]
4. CORROSION ALLOWANCE: 1/8" [3.18mm]
5. POST WELD HEAT TREATMENT: NO
6. RADIOGRAPHY: NONE
7. MINIMUM DESIGN METAL TEMPERATURE: -20F [-29C]
10. USE "TDE" WPS# 861.2 (TDE-2; TDE-3; TDE-4; TDE-6; TDE-8)
11. PAINT: COMM. SANDBLAST TO SSPC-SP6; ONE COAT MODIFIED ALKYLID PRIMER, TWO COATS WHITE ALKYLID ENAMEL FINISH
12. INSULATION: NONE
13. SHIPPING WEIGHT: 110 lbs [50 kg]
14. CAPACITY: 0.24 FT³ [0.007 m³]
15. REMOVE ALL WELD SLAG
16. VESSEL TO BE THOROUGHLY CLEANED INSIDE & OUTSIDE

ORIENTATION VIEW

N.T.S.

ELEVATION VIEW

ITEM	QTY	DESCRIPTION	MATERIAL
1	1	SET GASKET & BOLTING FOR 1" [25.4] - 600# ANSI RF FLG	SA-105
2	1	4" [103] RF BLIND FLG C/W 7/16" Ø HOLE	SA-105
3	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
4	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
5	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
6	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
7	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
8	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
9	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
10	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
11	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
12	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
13	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
14	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
15	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
16	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105
17	1	4" [103] RF 100# SCH 80 STRAIGHT TEE	SA-105

REVISION			
NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17

9038-0190-204	SHEET 1 OF 1	DOA REV. #0
DRUMMOND SHOAL CREEK MINE		
AGLOFLOAT COAL PREPARATION PLANT		
ALBERTA RESEARCH COUNCIL		
114[4 1/2"] OD x 914[3'-0"] F/F		
100[4"] 150# RF JET PROCESSOR		
M-105		

MARK	SIZE	QTY	TYPE	PAINT	SCALING	UNIT	ITEM	SERVICE
N1	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N2	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N3	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N4	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N5	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N6	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N7	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N8	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N9	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N10	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N11	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N12	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N13	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N14	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N15	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N16	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N17	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N18	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N19	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N20	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N21	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N22	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N23	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N24	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N25	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N26	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N27	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N28	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N29	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N30	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N31	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N32	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N33	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N34	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N35	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N36	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N37	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N38	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N39	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N40	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N41	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N42	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N43	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N44	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N45	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N46	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N47	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N48	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N49	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N50	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N51	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N52	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N53	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N54	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N55	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N56	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N57	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N58	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N59	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N60	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N61	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N62	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N63	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N64	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N65	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N66	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N67	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N68	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N69	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N70	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N71	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N72	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N73	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N74	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N75	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N76	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N77	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N78	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N79	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N80	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N81	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N82	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N83	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N84	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N85	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N86	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N87	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N88	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N89	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N90	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N91	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N92	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N93	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N94	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N95	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N96	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N97	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N98	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET
N99	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY INLET
N100	2-1/2"	1	FLANGE	801	801	1	FLANGE	SLURRY OUTLET

GENERAL NOTES:

- DESIGN PRESSURE: 14.0 PSIG @ 100°F (37.8°C)
- HYDROSTATIC TEST LEAK TEST WATER @ 100°F (37.8°C)
- CORROSION ALLOWANCE: 1/16" (1.59 mm)
- MINIMUM DESIGN METAL TEMPERATURE: -20°F (-29°C)
- RADIATION EFFECTS: NONE
- MINIMUM DESIGN METAL TEMPERATURE: -20°F (-29°C)
- WELDING: ASME SECTION VIII, DIVISION 1
- PAINT: COAT SANDBLAST TO SSPC-B, ONE COAT PRIMER AND TWO COATS INDUSTRIAL ENAMEL FINISH
- INSULATION: N/A
- SHIPPING WEIGHT: 600 lbs (272 kg)
- CAPACITY: 34 FT³ (0.96 m³)
- WELDING: ASME SECTION VIII, DIVISION 1
- VESSEL TO BE THOROUGHLY CLEANED INSIDE & OUTSIDE
- C.R. NO. NON CODE

DPE N-2, C-2
DPE N-1, C-1
DPE, FL-1
DPE, FL-2
DPE N-1, C-1

NOTE:
NOZZLES ROTATED FOR CLARITY

BAFFLE DETAIL
SCALE: 1:10

ITEM #8 DETAIL
SCALE: 1:10

ELEVATION VIEW
SCALE: 1:20

TOP VIEW
ORIENTATION
SCALE: 1:20

HORIZONTAL SECTION A-A
SCALE: 1:10

ITEM #12 DETAIL
SCALE: 1:10

ITEM #23 & #24 DETAIL
SCALE: 1:10

SUPPORT LAYOUT
SCALE: 1:20

NOZZLE SCHEDULE									
MARK	SIZE	QTY	TYPE	RATING	SCH	PROJ	MAT'L	ITEM#	SERVICE
N1	4" / 150	1	W/WT	150	4C	8" 1203	C	16.37	STURRY INLET
N2	4" / 150	1	W/WT	150	4C	8" 1203	C	16.37	STURRY INLET
N3	4" / 150	1	W/WT	150	4C	8" 1203	C	16.37	STURRY INLET
N4	4" / 150	1	W/WT	150	4C	8" 1203	C	16.37	STURRY INLET
N5	4" / 150	1	W/WT	150	4C	8" 1203	C	16.37	STURRY INLET
N6	4" / 150	1	W/WT	150	4C	8" 1203	C	16.37	STURRY INLET

* - METHOD OF ATTACHMENT PER UH-16.1

GENERAL NOTES:

- DESIGN PRESSURE: 14.9 PSIG @ 100°F [102 MPa @ 38°C]
- HYDROSTATIC TEST LEAK TEST [WATER @ ATM. PRESSURE]
- CORROSION ALLOWANCE: 1/16\"/>

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REVISION		DATE	BY
THERMO DESIGN ENGINEERING LTD. 9038-0190-202 SHEET: 1 OF 1 DOA REV. # 0			
DRUMMOND SHOAL CREEK MINE AGGLOFLOAT COAL PREPARATION PLANT ALBERTA RESEARCH COUNCIL 11600[43 5/16\"/>

SECTION VII

PLANT LAYOUT

PROJECT		DRUMMOND SHOAL CREEK MINE	
CLIENT		ALBERTA RESEARCH COUNCIL	
JOB CODE		DOA	
DRAWING NUMBER		9038-0190-001	
SCALE		N.T.S.	
REV. #		0	
DATE		MAR. 25/98	
BY		JOSE O.	
DESCRIPTION		COAL PREPARATION PLANT PIPING AND INSTRUMENTATION DIAGRAM

[illegible]

SECTION VIII

VESSEL FABRICATION DRAWINGS