

## OPERATION & CONTROL

### 1. Equipment

#### a) Amine Contactor

Amine/gas contact in the tower occurs on 12-20 ballast trays provided by Glitsch Canada Ltd. Three amine injection points have been provided, one each at trays #12, 16 and 20 to permit varying degrees of amine/gas contact in accordance with process requirements. Selection of the appropriate injection point will require some experimentation, however the process simulations, provided in the Data Book may be used to provide some guidance.

The trays should be inspected regularly to ensure they are clean as deposits could result in foaming, amine losses and poor acid gas removal.

Inlet gas temperatures should be held below 48° C for reasonable acid gas removal and low amine losses, and above 60 Deg. F to avoid foaming and poor acid gas removal.

Lean amine inlet temperature should be approximately 6° C higher than the gas temperature.

Anticipated gas stream pressure drop across the contactor is approximately 21 kPa.

#### b) Amine Scrubber

The amine scrubber has been provided to reduce amine losses in the process gas stream as well as from unexpected foaming or flows surges. The scrubber level gauge should be monitored regularly to identify these occurrences.

#### c) Amine Flash Tank

The Amine Flash Tank acts to remove entrained excess hydrocarbon liquids and vapors from the amine stream. This will avoid unnecessary breakout of excess gases in the Amine/Amine HEX and reduce downstream corrosion.

#### d) Amine Stripper

Counter-current stream contact in the Amine Stripper occurs over 20 ballast trays supplied by Glitch

Canada Ltd. The trays should be inspected regularly for cleanliness and weepage.

e) Amine Reboiler

The Amine Reboiler is a BKU Tema C heat exchanger. The amine solution is heated by a hot TEG solution passing through a U-tube coil bundle. Heat input to the reboiler is provided via flow control of the TEG, regulated by the reflux feed rate to the tower. The TEG flow control valve, FV-2771, is provided with an adjustable down-stop to ensure a minimum level of heat input to the reboiler.

Liquid level above the coil bundle in the reboiler is maintained by an overflow weir. The lean amine flows over the weir to surge compartment from which it is discharged under level control.

The best regeneration will be obtained at higher pressures. Higher operating pressures on the stripper increase the bottom temperature which, in turn, causes more complete stripping of the acid gases from the amine solution. However, increased temperatures lead to excess corrosion and to chemical degradation of the amine. Lean amine solution temperatures leaving the stripper are generally kept in the 110° to 115° C range with a valid absolute maximum temperature of not more than 127° C. This leads to a stripper bottom pressure in the range of 170 kPa (absolute) as a maximum.

f) Amine Cooler/Reflux Condenser

The reflux condenser is an aerial cooler, mounted in a common structure with the Amine Cooler. The Reflux Condenser has its own set of automatic top louvres which are under temperature control to control the operating temperature of the Reflux Accumulator. To prevent freezing problems during cold weather, the common structure of the aerial cooler is totally enclosed with automatic inlet and recirculation louvres under temperature control to control the plenum chamber temperature under the two coil bundles. In addition, a heating coil is provided for tie-in to the heat trace system to prevent freezing in the tube bundle.

g) Amine Circulation Pumps

The Amine Circulation Pumps are positive displacement pumps and hence, flow rate is fixed (7.45 m<sup>3</sup>/hr.)

However, should it become necessary, a bypass with globe valve has been provided to allow recirculation of excess flow around the pump on a temporary basis.

The pumps have been provided with vapor tight plunger covers which are vented outside the process building.

h) Amine Surge/MU Water/MU Amine Tank

Amine system surge capacity and make-up water and amine storage is provided in a single 3-compartment tank. Amine and water make-up is achieved via gravity flow and is controlled manually.

NOTE: Personnel should not attempt to walk on top of the tank as the top head has not been designed for external loading.

i) Amine Filters

Two amine filters have been provided. V8-2772 is a 5-micron filter designed to handle 100% of the amine circulation rate. V8-2773 is a 1 micron charcoal filter sized for 10% of the circulation rate and is intended to remove degradation products and smaller entrained contaminants. Flow control through the charcoal filter is achieved by pressure drop balancing utilizing a bypass globe valve.

j) Reflux Circulation

Condensed liquids and vapors from the amine stripper overheads are separated in the reflux drum (V8-2775). Vapors are discharged under back-pressure control to the acid gas flare system. The back-pressure control sets the operating pressure of the amine stripper and reboiler system.

Due to the low operating pressure of this system, substantial water losses can be experienced at this point. A mistex pad at the top of the reflux drum serves to minimize entrained water carry-over. Water losses are a function of the operating temperature of V8-2775, therefore, it is advisable to operate V8-2775 at as low a temperature as the amine regeneration system will permit.

Liquids are pumped by the reflux pumps (E10-2774-1/2) from V8-2775 to the top of the amine stripper under level control. The level controller operates a control valve located in a bypass line running from pump discharge back to V8-2775. This will ensure

that the pumps do not run dry and also that the amount of reflux returned to the stripper will be equal to that produced.

k) Acid Gas Flare system

Saturated acid gas from V8-2775 and vapour from the amine flash tank are collected in the flare knock-out drum and blowcase (V8-2030/V8-2040) for removal of the entrained liquids; vapors exit the top of V8-2030/V8-2040, are metered and then discharged from skid edge. Metered fuel gas for pilot/purge is injected to the acid gas flare stream immediately prior to discharge.

Liquids drain from V8-2030 to V8-2040 where they are discharged under level control to V8-2775. Fuel gas pressure is utilized to drive collected liquids from V8-2040 to V8-2775.

l) Purge Gas System

Sweet Fuel gas is provided at skid edge and is utilized to provide the following:

- a) Purge gas for the amine filters to remove sour gas content prior to element changeout.
- b) Blanket gas in the amine reboiler, stripper, and surge tank to prevent vacuum development during shutdown; this can also be utilized to purge the reboiler, stripper, reflux accumulator, condenser and flare K.O.drum.
- c) Pilot/purge gas for the acid gas flare line.

A.

## INTRODUCTION

### A.1 Scope of Supply

Equipment provided by Alco Gas & Oil is comprised of the following major components and their associated instrumentation, valving, and piping in accordance with the enclosed Mechanical Flowsheets and Bill of Material.

2 - Metering structural steel skids c/w:

- 1 - 48" I.D. x 50'-0" s/s Amine Contactor (V10-2771).
- 1 - 48" O.D. x 8'-0" s/s Amine Scrubber (V8-2771).
- 1 - 36" I.D. x 10'-0" s/s Amine Flash Tank (V8-2774).
- 1 - Peco 55-15-336 Amine Charcoal Filter (V8-2773).
- 1 - Alfa-Laval M10-BFG Amine/Amine HEX (G8-2771).
- 1 - 12 3/4" O.D. x 5'-0" s/s Reflux Accumulator (V8-2775).
- 1 - 12 3/4" O.D. Flare K.O. Drum/Blowcase (V8-2030/V8-2040).
- 1 - 24" O.D. x 50'-0" s/fof Amine Stripper (V10-2772).
- 1 - 15/28-240 BKU Amine Reboiler (G8-2774).
- 1 - 96" O.D. x 12'-0" OAL Amine Surge/Make-up Water/Make-up Amine Tank (V2-2771-1/2/3)
- 2 - Union 1 1/2 x 2 x 7 VCM Reflux Pumps (E10-2774-1/2).
- 2 - Union 1 1/2 x 2 x 7 VCM Booster Pumps (E10-2773-1/2).
- 2 - Union 1 7/8 x 3 TD-60 Amine Circulating Pumps (E10-2771-1/2).

\* Pumps provided are for one (1) operating and one (1) 100% spare.

1 - ACE E84RS Amine Cooler/Reflux Condenser (G8-2772/2773).

Acid Gas Flare and Pilot/Purge Gas meter runs (FE-3572 and FE-3573) were supplied by MacDonald Engineering Projects Ltd. and installed by Alco with instrumentation to be provided by others.

Electrical hookup, interconnecting piping and chemical charges are provided by others.

A recommended spare parts list has been included in this manual. No spare parts have been provided by Alco Gas & Oil. The spares list contained herein is provided for information only and is based on equipment manufacturers recommendations. Prices indicated are subject to change without notice, are provided for information only, and are subject to the suppliers terms and conditions of sale at the time of order.

## A.2 Design Conditions

The unit has been designed to sweeten up to  $1185 \times 10^3 \text{M}^3/\text{D}$  of gas with up to 200 ppm  $\text{H}_2\text{S}$  and 1%  $\text{CO}_2$ .

Process design was based on the following four inlet simulations provided by MacDonald Engineering Projects Ltd.

	RICH CASE
	<u>Low Pressure</u>
Vapour frac.	1.0000
Temperature C	43.0000
Pressure Kpa a	4920.0000
Molar Flow Kgmole/hr	1943.3542
Mass Flow Kg/hr	53293.8047
LiqVol Flow M3/hr	133.2416
Enthalpy KJ/hr	2.02687E+07
Density Kg/m3	68.1828
Mole Wt.	27.4236
Spec. Heat KJ/Kgmole-C	69.7022
Therm Cond Watt/m-K	0.0351
Viscosity Cp	0.0135
Z Factor	0.7475
Sur Tension Dyne/cm	----
Std Density Kg/m3	----
Methane	0.4760
Ethane	0.2556
Propane	0.1400
i-Butane	0.0179
n-Butane	0.0373
i-Pentane	0.0060
n-Pentane	0.0054
n-Hexane	0.0013
n-Octane	0.0001
CO2	1% Max.
H2S	200 ppm (max.)
Nitrogen	0.0553

	LEAN CASE
	<u>Low Pressure</u>
Vapour frac.	1.0000
Temperature C	43.0000
Pressure Kpa a	4920.0000
Molar Flow Kgmole/hr	2075.8179
Mass Flow Kg/hr	44588.6406
LiqVol Flow M3/hr	122.5855
Enthalpy KJ/hr	2.14316E+07
Density Kg/m3	46.0667
Mole Wt.	21.4800
Spec. Heat KJ/Kgmole-C	51.0415
Therm Cond Watt/m-K	0.0390
Viscosity Cp	0.0135
Z Factor	0.8665
Sur Tension Dyne/cm	----
Std Density Kg/m3	----
Methane	0.7749
Ethane	0.0732
Propane	0.0543
i-Butane	0.0082
n-Butane	0.0171
i-Pentane	0.0050
n-Pentane	0.0050
n-Hexane	0.0041
n-Octane	0.0015
CO2	1% Max.
H2S	200 ppm (max.)
Nitrogen	0.0474

RICH CASE  
High Pressure

Vapour frac.	1.0000
Temperature C	43.0000
Pressure Kpa a	9480.0000
Molar Flow Kgmole/hr	2012.3088
Mass Flow Kg/hr	56319.5234
LiqVol Flow M3/hr	139.3272
Enthalpy KJ/hr	1.53383E+07
Density Kg/m3	189.6525
Mole Wt.	27.9875
Spec. Heat KJ/Kgmole-C	114.6352
Therm Cond Watt/m-K	0.0491
Viscosity Cp	0.0210
Z Factor	0.5322
Sur Tension Dyne/cm	----
Std Density Kg/m3	----
Methane	0.4647
Ethane	0.2547
Propane	0.1445
i-Butane	0.0194
n-Butane	0.0414
i-Pentane	0.0073
n-Pentane	0.0068
n-Hexane	0.0021
n-Octane	0.0004
CO2	1% Max.
H2S	200 ppm (max.)
Nitrogen	0.0537



LEAN CASE  
High Pressure

Vapour frac.	1.0000
Temperature C	43.0000
Pressure Kpa a	9480.0000
Molar Flow Kgmole/hr	2077.4319
Mass Flow Kg/hr	44696.4180
LiqVol Flow M3/hr	122.7638
Enthalpy KJ/hr	1.90002E+07
Density Kg/m3	100.3462
Mole Wt.	21.5152
Spec. Heat KJ/Kgmole-C	61.3641
Therm Cond Watt/m-K	0.0454
Viscosity Cp	0.0159
Z Factor	0.7733
Sur Tension Dyne/cm	----
Std Density Kg/m3	----
Methane	0.7744
Ethane	0.0731
Propane	0.0544
i-Butane	0.0082
n-Butane	0.0171
i-Pentane	0.0050
n-Pentane	0.0050
n-Hexane	0.0041
n-Octane	0.0017
CO2	1% Max.
H2S	200 ppm (max.)
Nitrogen	0.0473

Complete process simulations for these cases are provided in Section B of this manual. Process simulation has been based on the use of aqueous methyldiethanolamine (MDEA) solution as the gas sweetening solvent and 20-tray amine contactor and stripper process vessels per Amoco's request.

Anticipated outlet gas H<sub>2</sub>S and CO<sub>2</sub> contents based on utilization of 20 trays in the amine contactor are as follows:

MDEA concentration:

(% by weight aqueous solution)	50%	45%
Circulation rate (USGPM)	29.69	32.29
H <sub>2</sub> S (ppm)	2.893	1.425
CO <sub>2</sub> (%)	0.558	0.546

Refer to the enclosed Mechanical Flowsheet for system mechanical design limitations.

The amine reboiler design presumes that 60% TEG @ 320°F is available as heating medium.

Amine contactor design provides for 30% turndown.

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- c) Pilot/purge gas for the acid gas flare line.

PURCHASE ORDER

P.O. NUMBER

1106PG07

**ANOCO CANADA PETROLEUM COMPANY LTD.**  
**Macdonald Engineering Projects Ltd.**  
 600, 1177 - 11th Avenue S.W., Calgary, Alberta, Canada T2R 1K9  
 Telephone (403) 228-3366 Telex 03-827769 Fax (403) 245-0219

AGENT

ORDER DATE

89-08-02

DATE REQUIRED

89-11-20

SHIP TO

T.B.A.

VENDOR

ALCO GAS & OIL PRODUCTION EQUIP. LTD.  
 #310, 4014 - MACLEOD TRAIL SOUTH  
 CALGARY, ALBERTA  
 T2G 2R7

ATTN: MR. KEN PELLETIER 243-5055

SHIP VIA	T.B.A.	FOB	TRUCKS EDMONTON	TERMS	NET	FED. SALES TAX	30 DAYS	EXEMPT
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ITEM	QUANTITY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
1	1 ONLY	<p>SKID MOUNTED PACKAGED GAS SWEETENING UNIT FOR ANOCO CANADA PETROLEUM COMPANY LTD. NIPISI DEBOTTLENECK PROJECT LSD 2-11-80-3 WSH</p> <p>CONFIRMATION OF FACSIMILE PLACEMENT OF ORDER 89-07-23 WITH YOUR 1 COPY TO KEN PELLETIER CALGARY, 1 COPY TO GORDON STEWART EDMONTON BY OUR MR. MARK YUSISHEN.</p> <p>TO SUPPLY:</p> <p>TO SUPPLY AND DESIGN ONE SKID MOUNTED, PACKAGED GAS SWEETENING UNIT AS PER YOUR ORIGINAL QUOTATION NO. 083-0353 AND DRAWINGS A-13031 SHT. 1 OF 2, A-13031 SHT. 2 OF 2 AND A-13032 DATED JUNE 6, 1989.</p> <p><u>PRICE SUMMARY</u></p> <p>BASE PRICE AS PER BID</p> <p><u>PRICE ADDITIONS, REVISIONS &amp; CLARIFICATIONS</u></p> <p>AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 9, 1989 WE REQUEST THE FOLLOWING:</p> <p>ITEM #2 FROM FAX                      ANIME CONTRACTOR GAS OUTLET ODV TO BE PNEUMATIC</p> <p>ITEM #3 FROM FAX                      ANIME FLASH TANK PSV TO BE BALANCED BELLOWS TYPE</p>		<p>3 589383.00</p> <p>3 1210.00</p> <p>1713.00</p>

IMPORTANT

Our Order Number must appear on Invoices, Packages and Correspondence. Invoice in Triplicate.

DOUGLAS HILBERT, MANAGER OF PROCUREMENT

WHITE — VENDOR  
 CANARY — FILE COPY

PINK — CLIENT  
 GOLDENROD — FIELD CONST. BOOK

BY

*[Handwritten signature]*



## Macdonald Engineering Projects Ltd.

600, 1177 - 11th Avenue S.W., Calgary, Alberta, Canada T2R 1K9  
Telephone (403) 228-3366 Telex 03-827769 Fax (403) 245-0219

PAGE 2

ORDER DATE 7  
89-06-02

ITEM	QUANTITY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
		ITEM #4 FROM FAX ELIMINATE ESDV'S ON AMINE INJECTION PUMPS	SUBTRACT	(2456.00)
		ITEM #5 FROM FAX DELETE DPT AND ALL THERMOWELLS ON AMINE CONTACTOR	SUBTRACT	(822.00)
		ITEM #6 FROM FAX DELETE ALL THERMOWELLS ON AMINE REGENERATOR	SUBTRACT	(151.00)
		ITEM #7 FROM FAX ADD SOLENOID VALVE ON LCV UPSTREAM OF AMINE REGENERATOR	ADD	339.00
		ITEM #8 FROM FAX THE DESIGN PRESSURE OF AMINE CONTACTOR AND SCRUBBER OF 1380 PSIG		N/C
		AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 22, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #1 FROM FAX TO CHANGE ALL REFLEX LEVEL GAUGES, EXCEPT TUBULAR TYPE, TO TRANSPARENT C/W ILLUMINATORS	ADD	3354.00
		ITEM #2 FROM FAX TO ADD LOW TEMPERATURE SWITCH EXPLOSION PROOF, ASCO, ON AMINE STRIPPER CONDENSER OUTLET, WIRING BY OTHERS	ADD	585.00
		ITEM #3 FROM FAX TO ADD LOW FLOW SWITCH (ONE ONLY) ON THE AMINE STRIPPER REFLUX PUMPS DISCHARGE (TELEMANIC), WIRING BY OTHERS.	ADD	1248.00
		ITEM #4 FROM FAX LADDER AND PLATFORM ON ONE SIDE OF AERIAL COOLER		N/C
		AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 23, 1989 WE REQUEST THE ACID GAS FLARE KNOCK OUT DRUM	ADD	14646.00
		AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 30, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #2 FROM FAX EXTRA FOR 48" I.D. X 50' 5/8 AMINE CONTACTOR W/ 20 TRAYS	ADD	40750.00
		EXTRA FOR 24" I.D. X 44' AMINE STRIPPER W/ 20 TRAY	ADD	2815.00





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600, 1177 - 11th Avenue S.W., Calgary, Alberta, Canada T2R 1K9  
Telephone (403) 228-3366 Telex 03-827769 Fax (403) 245-0219

P.O. NUMBER

11062007

PAGE 3

ORDER DATE  
89-08-02

ITEM	QUANTITY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
		ITEM #8 FROM FAX TO ADD A MIDWEST DPI WITH 3 - VALVE MANIFOLD (COMMON) TO THE RICH SIDE OF THE AMINE/AMINE HEAT EXCHANGER	ADD	\$ 659.00 ✓
		ITEM #11 FROM FAX EXTRA TO STRESS RELIEVE THE LEAN AMINE PIPING AND COMPONENTS	ADD	<del>4048.00</del> 4408.00 ✓
		ITEM #12 FROM FAX TO ADD A THIRD PHASE TO THE AMINE FLASH TANK. FLASH TANK BECOMES 30" I.D. X 10' S/S.	ADD	2662.00 ✓
		AS PER YOUR FACSIMILE TRANSMITTAL OF JULY 10, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #1 FROM FAX 48" I.D. AMINE SCRUBBER	ADD	4807.00 ✓
		40 HP AMINE CIRCULATION PUMPS	ADD	2188.00 ✓
		AMINE FILTER 55-15-336	ADD	3532.00 ✓
		CHARCOAL FILTER 10-3-22	ADD	5150.00 ✓
		36" O.D. AMINE FLASH TANK	ADD	1447.00 ✓
		ITEM #2 FROM FAX TO ADD A MIDWEST MODEL 120 DPI WITH SPDT SWITCH FOR HIGH DPA AND COUPLED WITH A 3 VALVE MANIFOLD FOR 2 TOWERS	1556.00	3112.00 ✓
		ITEM #4 FROM FAX TO ADD SOLENOID TO EV-2001	ADD	339.00 ✓
		AS PER YOUR FACSIMILE TRANSMITTAL OF JULY 14, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #3 FROM FAX 1" CPLG C/W VALVE AND PLUG (FOUR)	217.00	368.00 ✓
		AS PER YOUR CONVERSATION WITH ED GRENZ ON JULY 17, 1989 TO SEAL WELD THE FLOOR OF THE PACKAGED AMINE UNIT	ADD	1536.00 ✓
		TOTAL FOR PACKAGED AMINE UNIT		5785362.00
		PRICES ARE FIRM NOT SUBJECT TO ESCALATION.		784,778.



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89-08-02

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		<p><u>ATTACHMENTS</u></p> <p>THE FOLLOWING LIST OF ATTACHMENTS SHALL BECOME AN INTEGRAL PART OF THE PURCHASE ORDER SPECIFICATION REQUIREMENT</p> <ol style="list-style-type: none"> <li>1. MACDONALD ENGINEERING PROJECTS LTD. ORIGINAL INQUIRY DATED MAY 16, 1989 INCLUDING ALL ATTACHMENTS LISTED THEREIN (NOW IN YOUR POSSESSION).</li> <li>2. ALCO GAS &amp; OIL PRODUCTION EQUIPMENT QUOTATION #Q89-5358 DATED 89-06-06</li> <li>3. DRAWINGS #A13081 SHEET 1 OF 2, #A13081 SHEET 2 OF 2 AND #A13082 DATED 89-06-06.</li> <li>4. ALCO FACSIMILE EXTRA DATED 89-06-09</li> <li>5. -----DITTO----- 89-06-22</li> <li>6. -----DITTO----- 89-06-23</li> <li>7. -----DITTO----- 89-06-30</li> <li>8. -----DITTO----- 89-07-10</li> <li>9. -----DITTO----- 89-07-14</li> <li>10. MEPL FACSIMILE PO COMMITMENT DATED 89-07-23</li> </ol> <p><u>PROGRESS PAYMENTS</u></p> <p>PROGRESS INVOICES WILL BE ISSUED BASED UPON WORK IN PROGRESS AND MATERIALS RECEIVED AS AGREED BY MACDONALD ENGINEERING INSPECTION.</p> <p>NET 30 DAYS</p> <p><u>HOLDBACK</u></p> <p>A 15% HOLDBACK AS PER THE TERMS OF THE BUILDERS LIEN ACT WILL BE APPLICABLE TO THE INVOICING ON THIS PROJECT.</p> <p><u>DRAWINGS AND DATA MANUALS REQUIRED</u></p> <ol style="list-style-type: none"> <li>1 SEPIA OF ALL DRAWINGS FOR APPROVAL</li> <li>2 SEPIA OF ALL DRAWINGS CERTIFIED "AS BUILT"</li> <li>3 COPIES OF PLANT OPERATING AND MAINTENANCE MANUALS INCLUDING CATALOGUES OR DATA SHEETS FOR ALL ITEMS ON</li> </ol>		4408.00



# Macdonald Engineering Projects Ltd.

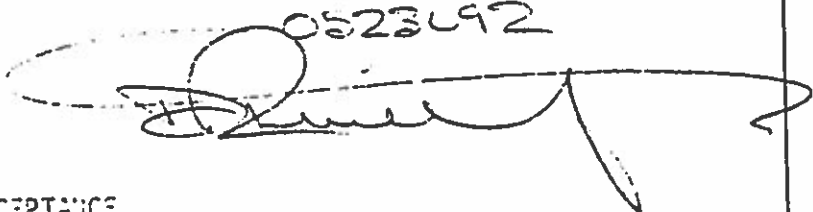
600, 1177 - 11th Avenue S.W., Calgary, Alberta, Canada T2R 1K9  
Telephone (403) 228-3366 Telex 03-827769 Fax (403) 245-0219

P.O. NUMBER

1106P007

PAGE 5

ORDER DATE  
89-09-02

ITEM	QUANTITY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
		<p>THE SKID</p> <p>3 COPIES OF ALL REGISTRATIONS, MILL TEST CERTIFICATES AND TEST REPORTS.</p> <p><u>WARRANTIES &amp; GUARANTEES</u></p> <p>IT IS A CONDITION OF THIS PURCHASE ORDER THAT ALL WARRANTIES &amp; GUARANTEES GIVEN THE PURCHASER ARE TO BE TRANSFERRED TO THE OWNER/END USER BEING AMOCO CANADA PETROLEUM COMPANY LTD.</p> <p><u>START-UP ASSISTANCE</u></p> <p>ALCO GAS &amp; OIL TO PROVIDE A SERVICE REP. FOR ONE DAY TO START UP AND COMMISSION THE AMINE UNIT.</p> <p><u>DELIVERY</u></p> <p>QUOTED 16-18 WEEKS AFTER RECEIPT OF ORDER PLACED JULY 26, 1989</p> <p><u>FEDERAL SALES TAX</u></p> <p style="text-align: center;">0523492 </p> <p><u>ACCEPTANCE</u></p> <p>VENDOR SHALL DULY EXECUTE AND RETURN THE XEROX COPY AS AN ACCEPTANCE OF THIS PURCHASE ORDER WITHIN 10 CALENDAR DAYS.</p> <p>ACCEPTED: <u>ALCO GAS &amp; OIL PRODUCTION EQUIPMENT LTD.</u></p> <p>BY: _____</p> <p>DATE: _____</p> <p>COST CODE: M6572</p>		

PURCHASE ORDER

P.O. NUMBER

1106PC07

**ANOCO CANADA PETROLEUM COMPANY LTD.**  
**Macdonald Engineering Projects Ltd.**  
 600, 1177 - 11th Avenue S.W., Calgary, Alberta, Canada T2R 1K9  
 Telephone (403) 228-3366 Telex 03-827769 Fax (403) 245-0219

AGENT

ORDER DATE  
 89-08-02

DATE REQUIRED  
 89-11-20

SHIP TO

T.B.A.

VENDOR

ALCO GAS & OIL PRODUCTION EQUIP. LTD.  
 #310, 4014 - MACLEOD TRAIL SOUTH  
 CALGARY, ALBERTA  
 T2G 2R7

ATTN: MR. KEN PELLETIER 243-5055

SHIP VIA		FOB	TERMS	FED. SALES TAX	EXEMPT
T.B.A.		TRUCKS EDMONTON		30 DAYS	
ITEM	QUANTITY	ITEM DESCRIPTION		UNIT PRICE	TOTAL
1	1 ONLY	SKID MOUNTED PACKAGED GAS SWEETENING UNIT FOR ANOCO CANADA PETROLEUM COMPANY LTD. NIPISSI DEBOTTLENECK PROJECT LSD 2-11-80-3 VSH  CONFIRMATION OF FACSIMILE PLACEMENT OF ORDER 89-07-23 WITH YOUR 1 COPY TO KEN PELLETIER CALGARY, 1 COPY TO GORDON STEWART EDMONTON BY OUR MR. MARK YUSISHER.  TO SUPPLY:  TO SUPPLY AND DESIGN ONE SKID MOUNTED, PACKAGED GAS SWEETENING UNIT AS PER YOUR ORIGINAL QUOTATION NO. Q20-0358 AND DRAWINGS A-10081 SHT. 1 OF 2, A-10081 SHT. 2 OF 2 AND A-10032 DATED JUNE 6, 1989.  <u>PRICE SUMMARY</u>  BASE PRICE AS PER BID 3 589383.00  <u>PRICE ADDITIONS, REVISIONS &amp; CLARIFICATIONS</u>  AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 9, 1989 WE REQUEST THE FOLLOWING:  ITEM #2 FROM FAX ANILINE CONTRACTOR GAS OUTLET SDV TO BE PNEUMATIC ADD 3 1219.00  ITEM #5 FROM FAX ANILINE FLASH TANK PSV TO BE BALANCED BELLOW TYPE ADD 1713.00 ANILINE RECYCLER PSV TO BE BALANCED BELLOW TYPE ADD 1713.00			

IMPORTANT

Our Order Number must appear on Invoices, Packages and Correspondence. Invoice in Triplicate.

JOHN W. HILBERT, MANAGER OF PROCUREMENT

WHITE — VENDOR  
 CANARY — FILE COPY

PINK — CLIENT  
 GOLDENROD — FIELD CONST. BOOK

BY



# Macdonald Engineering Projects Ltd.

600, 1177 - 11th Avenue S.W., Calgary, Alberta, Canada T2R 1K9  
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P.O. NUMBER

11052007

PAGE 2

ORDER DATE 89-02-02

ITEM	QUANTITY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
		ITEM #4 FROM FAX ELIMINATE ESDV'S ON AMINE INJECTION PUMPS	SUBTRACT	(2456.00)
		ITEM #5 FROM FAX DELETE DPT AND ALL THERMOWELLS ON AMINE CONTACTOR	SUBTRACT	(822.00)
		ITEM #6 FROM FAX DELETE ALL THERMOWELLS ON AMINE REGENERATOR	SUBTRACT	(151.00)
		ITEM #7 FROM FAX ADD SOLENOID VALVE ON LCV UPSTREAM OF AMINE REGENERATOR	ADD	339.00
		ITEM #8 FROM FAX THE DESIGN PRESSURE OF AMINE CONTRACTOR AND SCRUBBER OF 1300 PSIG		N/C
		AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 22, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #1 FROM FAX TO CHANGE ALL REFLEX LEVEL GAUGES, EXCEPT TUBULAR TYPE, TO TRANSPARENT C/W ILLUMINATORS	ADD	3354.00
		ITEM #2 FROM FAX TO ADD LOW TEMPERATURE SWITCH EXPLOSION PROOF, ASCO, ON AMINE STRIPPER CONDENSER OUTLET, WIRING BY OTHERS	ADD	585.00
		ITEM #3 FROM FAX TO ADD LOW FLOW SWITCH (ONE ONLY) ON THE AMINE STRIPPER REFLUX PUMPS DISCHARGE (TELEMIATIC), WIRING BY OTHERS.	ADD	1246.00
		ITEM #4 FROM FAX LADDER AND PLATFORM ON ONE SIDE OF AERIAL COOLER		N/C
		AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 23, 1989 WE REQUEST THE ACID GAS FLARE KNOCK OUT DRUM	ADD	14645.00
		AS PER YOUR FACSIMILE TRANSMITTAL OF JUNE 30, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #2 FROM FAX EXTRA FOR 48" I.D. X 50' S/S AMINE CONTACTOR W/ 20 TRAYS	ADD	46750.00
		EXTRA FOR 24" I.D. X 44' AMINE STRIPPER W/ 20 TRAY	ADD	2815.00



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11062007

PAGE 3

ORDER DATE  
89-08-02

ITEM	QUANTITY	ITEM DESCRIPTION	UNIT PRICE	TOTAL
		ITEM #8 FROM FAX TO ADD A MIDWEST DPI WITH 3 - VALVE MANIFOLD (COMMON) TO THE RICH SIDE OF THE AMINE/AMINE HEAT EXCHANGER	ADD	\$ 659.00
		ITEM #11 FROM FAX EXTRA TO STRESS RELIEVE THE LEAN AMINE PIPING AND COMPONENTS	ADD	<del>4048.00</del> 4428.00
		ITEM #12 FROM FAX TO ADD A THIRD PHASE TO THE AMINE FLASH TANK. FLASH TANK BECOMES 30" I.D. X 10' S/S.	ADD	2662.00
		AS PER YOUR FACSIMILE TRANSMITTAL OF JULY 10, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #1 FROM FAX 48" I.D. AMINE SCRUBBER	ADD	4807.00
		40 HP AMINE CIRCULATION PUMPS	ADD	2128.00
		AMINE FILTER 55-15-336	ADD	3532.00
		CHARCOAL FILTER 10-3-22	ADD	5150.00
		36" O.D. AMINE FLASH TANK	ADD	1447.00
		ITEM #2 FROM FAX TO ADD A MIDWEST MODEL 120 DPI WITH SPDT SWITCH FOR HIGH DPA AND COUPLED WITH A 3 VALVE MANIFOLD FOR 2 TOWERS	1556.00	3112.00
		ITEM #4 FROM FAX TO ADD SOLENOID TO EV-2001	ADD	339.00
		AS PER YOUR FACSIMILE TRANSMITTAL OF JULY 14, 1989 WE REQUEST THE FOLLOWING:		
		ITEM #3 FROM FAX 1" CPLG C/W VALVE AND PLUG (FOUR)	217.00	368.00
		AS PER YOUR CONVERSATION WITH ED GNEZ ON JULY 17, 1989 TO SEAL WELD THE FLOOR OF THE PACKAGED AMINE UNIT	ADD	1536.00
		TOTAL FOR PACKAGED AMINE UNIT		5785362.00
		PRICES ARE FIRM NOT SUBJECT TO ESCALATION.		784,778.



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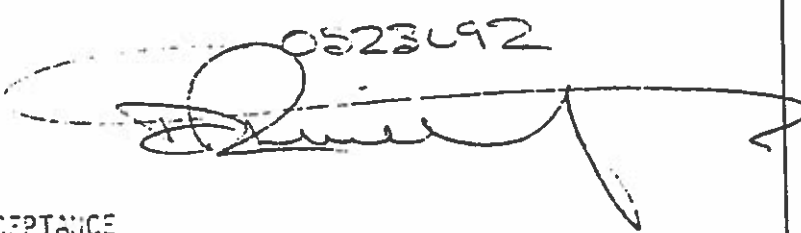
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1106P007

PAGE 5

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89-09-02

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