

PLAINTIFF'S EXHIBIT

TEX-119

ADDENDUM TO THE OPERATING MANUAL

CATALYTIC POLYMERIZATION UNIT

PLANT 5J

TEXACO INC.

PUGET SOUND PLANT

ESTIMATE 3910

BECHTEL INCORPORATED

HOUSTON, TEXAS

1973

WA-TEX 000376

1. GENERAL
DESCRIPTION

1 - GENERAL DESCRIPTION

A. INTRODUCTION

This addendum to the Operating Manual for the Catalytic Polymerization Unit at the Puget Sound Works of TEXACO Inc., Anacortes, Washington, covers the revamp of the Catalytic Polymerization Unit. The principal new equipment for this revamp is:

Saturated C₃-C₄ Amine Treater

Saturated C₃-C₄ Caustic Treater

Saturated C₃-C₄ Regenerated Caustic Treater

Saturated C₃-C₄ Salt Filter

Propane Stripper

Attendant facilities for heat exchange, transfer of liquids, and control of operations.

B. BASIS OF DESIGN

General

In the feed preparation section, the revamp is limited to the cracked C₃-C₄ treater and the saturated C₃-C₄ treaters. The cracked C₃-C₄ treaters are to treat 7,963 BPSD of C₃-C₄ from the Gas Recovery Unit. The saturated C₃-C₄ treaters are to treat a combined total of 7,017 BPSD of C₃-C₄ from the Crude Unit and the CRU.

In the recovery section, the revamp covers only the depropanizer. The depropanizer feed is the effluent from the saturated treaters in the feed preparation section. The condensed depropanizer overhead stream is fed to a new propane stripper from which 420 BPSD of propane product is recovered.

Process flow conditions for the revamped unit are shown on process flow diagrams 5-RA-1 and 5-RA-2.

C. DESCRIPTION OF ADDITIONS AND MODIFICATIONS TO THE UNIT

This section describes only additions and significant modifications to the Catalytic Polymerization Unit. Reference should be made to the Operating Manual for the Catalytic Polymerization Unit for a description of the existing facilities.

Feed Preparation Section (Reference P&ID's 5-RA-4 and 5-RA-25)

The cracked C_3 - C_4 treaters are satisfactory, except that the 1-inch Raschig rings in the cracked C_3 - C_4 water wash treater, 5J-C5, are replaced with 2-inch Raschig rings.

Due to the higher feed rate, the saturated C_3 - C_4 treaters and salt filter are replaced. The existing treaters are left in place, and may be used as standby for the cracked treaters. The saturated C_3 - C_4 amine treater, 5J-C57, has 23 sieve trays. The saturated C_3 - C_4 caustic treater, 5J-C58, and the saturated C_3 - C_4 regenerated caustic treater, 5J-C59, have packed beds of 2-inch carbon Raschig rings.

The saturated feed stream from the CRU and the Crude Unit flows in sequence through the saturated C_3 - C_4 amine treater, 5J-C57, the saturated C_3 - C_4 caustic treater, 5J-C58, the saturated C_3 - C_4 regenerated caustic treater, 5J-C59, and the salt filter, 5J-C60. The treated stream flows through the depropanizer feed-bottoms exchanger, 5J-E57, to the cat. poly. depropanizer, 5J-C17.

Tie-ins are made at the amine charge pump, 5J-G6, between the present Amine Regeneration Unit and the new Amine Regeneration Unit (Estimate 3600). The saturated C_3 - C_4 amine treater, 5J-C57, and the cracked C_3 - C_4 amine treater, 5J-C2, may be continued in operation when the present Amine Regeneration Unit is down for turnaround and inspection, by using regenerated amine from the new Amine Regeneration Unit.

Recovery Section (Reference P&ID 5-RA-5)

The existing depropanizer, 5J-C17, is provided with a new feed-bottoms exchanger, 5J-E51. A new depropanizer feed bypass pump, 5J-G62, is also provided that permits saturated C_3 - C_4 from the feed preparation section to be pumped directly to CRU No. 2. The bottoms product from the depropanizer, 5J-C17, flows through the depropanizer feed-bottoms exchanger, 5J-E57, and the depropanizer bottoms cooler, 5J-E59, to alkylation or storage. The cat. poly. debutanizer, 5J-C19, is not in service, since the Debutanizer in the atmospheric tower overhead section is in service.

Liquid overhead product from the depropanizer, 5J-C17, is pumped from the cat. poly. depropanizer accumulator, 5J-C18, to the propane stripper, 5J-C61. The propane stripper is packed with 30 feet of 1-1/2-inch carbon steel pall rings. Overhead vapor from the propane stripper, 5J-C61, is combined with vapor from the cat. poly. depropanizer accumulator, 5J-C18, and the combined stream is sent to compressor fuel. Alternately, the propane stripper overhead vapor may be routed through the depropanizer condenser, 5J-E13. Reboil heat is supplied to the propane stripper, 5J-C61, in the propane stripper reboiler, 5J-E58, by exhaust steam. Propane stripper bottoms product is cooled in the LPG cooler, 5J-E18, and sent to storage.

Utilities

Utility consumption by new or modified equipment is given in the following table:

<u>Item No.</u>	<u>Service</u>	<u>Consumption</u>
<u>Exhaust Steam</u>		
5J-E58	Propane Stripper Reboiler	585 Lb./Hr.
<u>Cooling Water</u>		
5J-E59	Depropanizer Bottoms Cooler	146 GPM
<u>Electrical</u>		
5J-G62 & G62A	Depropanizer Feed Bypass Pump & Spare	7.7 HP

2. CONTROL FEATURES

11- CONTROL FEATURES

A. PRINCIPAL CONTROL FEATURES

This section describes only additions and significant modifications to the Catalytic Polymerization Unit controls. Reference should be made to the Operating Manual for the Catalytic Polymerization Unit for a description of existing controls.

Feed Preparation Section (Reference P&ID 5-RA-25)

The control scheme for the new saturated C_3-C_4 treaters is the same as the control scheme for the existing saturated C_3-C_4 treaters. A description of the principal control features of the saturated C_3-C_4 feed preparation section follows.

The flow rates of saturated C_3-C_4 streams from the Crude Unit debutanizer and the Platformer debutanizer are controlled in their respective units. The combined saturated C_3-C_4 stream flows in sequence through the saturated C_3-C_4 amine treater, 5J-C57, the saturated C_3-C_4 caustic treater, 5J-C58, the saturated C_3-C_4 regenerated caustic treater, 5J-C59, and the saturated C_3-C_4 salt filter, 5J-C60. The treated stream passes through the depropanizer feed/bottoms exchanger, 5J-E57, to the cat. poly. depropanizer, 5J-C17. The pressure in the saturated C_3-C_4 treater section is set by the pressure in the cat. poly depropanizer, 5J-C17. Control of the cat. poly. depropanizer pressure is described in the following section.

The flow rate of regenerated amine to the saturated C_3-C_4 amine treater, 5J-C57, is controlled by flow controller 5FIC-200. The flow rate of spent amine from the bottom of the saturated C_3-C_4 amine treater is controlled by interface level controller 5LIC-201 to maintain an amine solution-hydrocarbon interface in the top of the amine treater. High and low level alarms, 5LAH-201 and 5LAL-201, are provided for the amine solution-hydrocarbon interface.

Spent caustic is drained from the saturated C_3-C_4 caustic treater, 5J-C58, to spent caustic storage by manual control. The spent caustic is drained when the caustic-hydrocarbon interface appears in level glass 5LG-202. Care must be taken when draining the spent caustic to prevent hydrocarbons entering the spent caustic system. Fresh caustic and dilution water are charged to the saturated C_3-C_4 caustic treater, 5J-C58, by manual control. Fresh caustic is charged when the caustic-hydrocarbon interface appears in level glass 5LG-203.

The flow rate of regenerated caustic to the saturated C_3-C_4 regenerated caustic treater, 5J-C59, is controlled by flow controller 5FIC-201. The flow

rate of spent caustic from the bottom of the saturated C_3-C_4 regenerated caustic treater is controlled by interface level controller, 5LIC-205, to maintain a caustic-hydrocarbon interface in the top of the regenerated caustic treater. High and low level alarms, 5LAH-205 and 5LAL-205, are provided for the caustic-hydrocarbon interface.

Water that accumulates in the bottom of the saturated C_3-C_4 salt filter is drained to the oily water sewer by manual control. The water-hydrocarbon interface may be observed in level glass LG-506.

Recovery Section (Reference P&ID 5-RA-5)

The amount of saturated C_3-C_4 from the feed preparation section that is pumped directly to CRU No. 2 is controlled by flow controller 5FIC-205.

When the propane stripper, 5J-C61, is in operation, a vapor product will be leaving the depropanizer-propane stripper system. For this case, 5HCV-6 and 5HC-20 should be positioned such that the depropanizer pressure controller, 5PIC-106, positions control valve 5PIC-106VB to adjust vapor flow from the system, and the cat. poly. depropanizer accumulator level controller, 5LIC-49, positions control valve 5PIC-106VA to regulate cooling water flow to the depropanizer condenser, 5J-E13. Feed to the propane stripper will be regulated by flow controller 5FIC-207.

When the propane stripper, 5J-C61, is not in operation, an all liquid cat. poly. depropanizer overhead product may be obtained. For this case, 5HCV-6 should be positioned such that the depropanizer pressure controller, 5PIC-106, positions control valve 5PIC-106VA to adjust cooling water flow to the depropanizer condenser, 5J-E13, and the cat. poly. depropanizer accumulator level controller, 5LIC-49, resets the net product flow controller, 5FIC-207. Noncondensibles may be vented from the system periodically by operating hand controller 5HC-20 to open control valve 5PIC-106VB in the accumulator vapor line. A description of other controls on the cat. poly. depropanizer is given on page 21 of the Operating Manual for the Catalytic Polymerization Unit.

The temperature of the propane stripper bottoms is controlled by temperature controller 5TIC-205 that adjusts condensate discharge from the propane stripper reboiler, 5J-E58. Level in the bottom of the propane stripper, 5J-C61, is controlled by level controller 5LIC-210 that adjusts discharge of LPG from the stripper.

3. PREPARATION
FOR STARTUP

III - PREPARATIONS FOR OPERATIONS

Reference should be made to the Operating Manual for the Catalytic Polymerization Unit for a description of preparations for operations.

4. STARTUP PROCEDURE

IV - STARTUP PROCEDURE

A. GENERAL

Reference should be made to the Operating Manual for the Catalytic Polymerization Unit for a description of the startup procedure for existing equipment. The startup procedure for the new saturated C_3-C_4 treating section is similar to the startup procedure for the existing saturated C_3-C_4 treating section, and the existing procedure should be used.

B. RECOVERY SECTION

The cat. poly. depropanizer, 5J-C17, and its related equipment, can be started up by the procedure given in the Operating Manual for the Catalytic Polymerization Unit. The new depropanizer bottoms cooler, 5J-E59, and the new depropanizer feed/bottoms exchanger, 5J-E57, are steam purged, tightness-tested, filled with fuel gas, and brought onstream in conjunction with the cat. poly. depropanizer.

The following procedure for startup of the propane stripper, 5J-C61, and its related equipment, assumes that the cat. poly. depropanizer system is operating. The same procedure, with minor modifications, can be used for start-up of the propane stripper in conjunction with startup of the cat. poly. depropanizer. An outline of the startup procedure is as follows:

1. Steam-purge for elimination of air.
2. Tightness-test and gas-fill.
3. Inventory and circulate to dry.
4. Adjust operating conditions.

Introduce steam through the steamout connection of the propane stripper and vent steam and air through the 2-inch vent at the top of the propane stripper. Permit the tubes of the propane stripper reboiler, 5J-E58, to fill with steam condensate. When the propane stripper is thoroughly purged, as evidenced by a strong show of steam from the vent, throttle the vent. Purge the propane stripper overhead line, 5J-0-219-3", to the block valve at line 6"-5J-0-45. Purge line 5J-0-220-3" to the block valve at line 4"-5J-0-162.

NOTE: The propane stripper feed line, 5J-0-225-3", and the propane stripper bottoms line, 5J-0-224-3", have been purged and placed in service. These lines will contain hydrocarbons up to the block valves at the propane stripper when the cat. poly. depropanizer is in service.

Close the vent valve on the propane stripper and tightness-test at 25 psig with steam. Drain steam condensate from all low point drains. After a successful tightness test, reduce the steam pressure to about 5 psig. Slowly pressurize the propane stripper by allowing cat. poly. depropanizer overhead vapors to enter the propane stripper through line 5J-0-219-3".

Drain steam condensate from all low point drains. Inventory the propane stripper with liquid from the cat. poly. depropanizer accumulator, 5J-C18, through the propane stripper feed line. Commission the propane stripper reboiler, 5J-E58, and allow overhead vapor from the propane stripper to pass through the depropanizer condenser, 5J-E13, to the cat. poly. depropanizer accumulator, 5J-C18. Add inventory to the propane stripper as required. Continue operation in this manner until the propane stripper is free of water.

During the above propane stripper drying procedure, 5HCV-6 has been positioned such that the cat. poly. depropanizer pressure controller, 5PIC-106, regulates cooling water flow to the depropanizer condenser, and the cat. poly. depropanizer accumulator level controller, 5LIC-49, resets the net overhead product flow controller, 5FIC-207. The net liquid product passes through the LPG cooler, 5J-C20, to the chiller. After the propane stripper is dried, it may be brought onstream by the following steps:

1. Reroute propane stripper overhead vapor from the depropanizer condenser to the cat. poly. depropanizer accumulator vapor line, 4"-5J-0-162.
2. Reposition 5HCV-6 such that the cat. poly. depropanizer pressure controller, 5PIC-106, regulates vapor flow from the cat. poly. depropanizer accumulator, and the cat. poly. depropanizer accumulator level controller, 5LIC-49, regulates cooling water flow to the depropanizer condenser, 5J-E13. Flow of net liquid from the cat. poly. depropanizer accumulator is regulated by flow controller 5FIC-207.
3. Net liquid product from the cat. poly. depropanizer accumulator is rerouted from the LPG cooler, 5J-E18, to the propane stripper.
4. Bottoms product from the propane stripper is routed through the LPG cooler to the chiller. The propane stripper level controller, 5LIC-210, is put in service to regulate flow of propane stripper bottoms.
5. The propane stripper temperature controller, 5TIC-205, is put in service to regulate steam condensate flow from the propane stripper reboiler, 5J-E58.

6. SHUTDOWN
PROCEDURE

VI - SHUTDOWN PROCEDURES

Reference should be made to the Operating Manual for the Catalytic Polymerization Unit for a description of shutdown procedures for existing equipment. The shutdown procedure for the new saturated C_3-C_4 treating section is similar to the shutdown procedure for the existing saturated C_3-C_4 treating section, and the existing procedure should be used.

The propane stripper, 5J-C61, is shut down in conjunction with the cat. poly. depropanizer, 5J-C17, as follows:

1. Discontinue steam to the propane stripper reboiler, 5J-E58.
2. Pump out liquid products to storage as described in the Operating Manual for the Catalytic Polymerization Unit.
3. Depressure the system to flare.
4. Purge the system with steam to remove all hydrocarbon vapors and vent to the atmosphere.

Emergency shutdown procedures described in the Operating Manual for the Catalytic Polymerization Unit are applicable to the new saturated C_3-C_4 treating section and the propane stripper.

9. SAFETY FEATURES
& REGULATIONS

IX - SAFETY FEATURES AND REGULATIONS

Reference should be made to the Operating Manual for the Catalytic Polymerization Unit for a discussion of safety features and regulations.

The new relief valves installed are listed below:

<u>Relief Valve No.</u>	<u>Service</u>
5PSV-101	Saturated C ₃ -C ₄ Amine Treater, 5J-C57
5PSV-102	Saturated C ₃ -C ₄ Caustic Treater, 5J-C58
5PSV-103	Saturated C ₃ -C ₄ Regenerated Caustic Treater, 5J-C59
5PSV-104	Saturated C ₃ -C ₄ Salt Filter, 5J-C60
5PSV-105	Propane Stripper, 5J-C61

All of the new relief valves discharge through the existing header system to the existing blowdown drum, 5J-C29. Bypass valves are provided around each of the new relief valves, so that the related equipment can be vented to the existing header system.

10. APPENDIX

10.1 PROCESS AND UTILITY DIAGRAMS

PROCESS FLOW DIAGRAM

5-RA-1

WA-TEX 000395

PROCESS FLOW DIAGRAM

5-RA-2

 EXISTING
 NEW
 REMOVE
 RELOCATE
 NOT USED - DO NOT REMOVE
 DENOTES TIE-IN NUMBERS

1. REVISIONS OF MAJOR SYSTEMS ARE DESIGNATED BY THE SYMBOLS SHOWN ABOVE. MINOR REVISIONS ARE CIRCLED AND INCLUDE A TRIANGULAR REVISION MARK.
2. PIPING SERVICE SPECIFICATIONS FOR NEW LINES ARE IN ACCORDANCE WITH CHEM J-208 TABLE 7.
3. LINE NO. SUFFIXES FOR INSULATION ON NEW LINES ARE IDENTIFIED AS FOLLOWS:
 - PP PERSONNEL PROTECTION
 - CC COLD CONSERVATION
 - PHC PARTIAL HEAT CONSERVATION
 - FHC FULL HEAT CONSERVATION
 - OTC OPERATING TEMPERATURE CONTROL
 - ST STEAM TRACED & INSULATED
 - NI NO INSULATION

TA-O-432-6"-312A-N1
 TEXACO PLANT NUMBER TEXACO SERVICE STAMP SIZE INSULATION REQUIREMENTS
 TEXACO PIPING MATERIAL SERVICE SPECIFICATION

[illegible]

BECHTEL

HOUSTON



TEXACO INC.



PUGET SOUND PLANT

UTILITY PIPING & INSTRUMENT DIAGRAM
STEAM & CONDENSATE SYSTEMS
CATALYTIC POLYMERIZATION UNIT

	Lab No.	Shop No.	Rev.
	WENTON - 90070 TEACOR EST - 3010	5-AA-7	11A

INSULATION PERSONNEL PROTECTION

ABOLIS

"UNSUBMITTED"

LOCATION

LOCATION

LOCATION

SPEC. (RECHTEL)

DIAL NUMBER

SERVICE DESIGNATION

UNIT (T.F.CO.)

NUMBER (RECHTEL)

28

ION

100, FUEL GAS

AYER

LOCATION

ALLOW

10-700

10-715

10-51-0-717 & 40

10-51-0-700

ADDED ON 2-11-10

INGS

UNIT	5-02-8
UNIT	5-02-5
UNIT	5-02-0
UNIT	5-02-7
UNIT	5-02-11
BLOWDOWN	5-02-1
BLOWDOWN	5-02-8

LOCATION

COMPANY

UT DIAGRAM

SYSTEMS

UT

AA-10

NEW
REMOVE
RELOCATE
NOT USED (DO NOT REMOVE)
DEMOTES TIE-IN NUMBERS

NOTES

1. REVISIONS OF MAJOR SYSTEMS ARE DESIGNATED BY THE SYMBOLS SHOWN ABOVE. MINOR REVISIONS ARE CIRCLED AND INCLUDE A TRIANGULAR REVISION MARK.
2. PIPING SERVICE SPECIFICATIONS FOR NEW LINES ARE IN ACCORDANCE WITH GEMS J-208, TABLE 7.
3. LINE NUMBER SUFFIXES FOR INSULATION ARE IDENTIFIED AS FOLLOWS:
PP PERSONNEL PROTECTION
CC COLD CONSERVATION
PHC PARTIAL HEAT CONSERVATION
FHC FULL HEAT CONSERVATION
OTC OPERATING TEMPERATURE CONTROL
ST STEAM TRACED
NI NO INSULATION



LINE IDENTIFICATION			
1A-0-427-6-112A-N1	INSULATION REQUIREMENTS		
TEXACO PLANT NUMBER	TEXACO SERVICE SYMBOL	SIZE NUMBER	TEXACO PIPING MATERIAL SERVICE SPECIFICATION



2-1-73	REVISED PER DRAWING	5-AA-110 REV. 1A	20	11	24	24	24
7/9/73	REVISED PER DRAWING	5-AA-110 REV. 0	10	11	11	11	11
7/9/73	ISSUED FOR CONSTRUCTION		20	26	26	26	26
7/9/73	UPDATED TO JOB ANNEX		20	26	26	26	26
7/9/73	ISSUED FOR APPROVAL		20	26	26	26	26

SCALE NONE DESIGNED DRAWN

RECHTEL
HOUSTON

TEXACO INC.
PUGET SOUND PLANT

UTILITY PIPING & INSTRUMENT DIAGRAM
AIR & BLOWDOWN SYSTEMS
CAT. POLY. UNIT

RECHTEL - 10009	5-AA-10	11A
TEXACO INC. - 2010		

BECHTEL-10095
TEXACO EST-3910

STATION
SPARE SYSTEM

HYDRANT

TEL

441-04

3)

301

SYMBOLS

EXISTING

NEW

REMOVE

RELOCATE

NOT USED - (DO NOT REMOVE)

DENOTES TIE-IN NUMBERS

NOTES

- REVISIONS OF MAJOR SYSTEMS ARE DESIGNATED BY THE SYMBOLS SHOWN ABOVE. MINOR REVISIONS ARE CIRCLED AND INCLUDE A TRIANGULAR REVISION MARK.
- PIPING SERVICE SPECIFICATIONS FOR NEW LINES ARE IN ACCORDANCE WITH GEMS J-208, TABLE 7.
- LINE NUMBER SUFFIXES FOR INSULATION ON NEW ARE IDENTIFIED AS FOLLOWS:
 - PP PERSONNEL PROTECTION
 - CC COLD CONSERVATION
 - PHC PARTIAL HEAT CONSERVATION
 - PHC FULL HEAT CONSERVATION
 - OTC OPERATING TEMPERATURE CONTROL
 - ST STEAM TRACED
 - NI NO INSULATION

LINE IDENTIFICATION

1A-0-432-6-113A-N1

TEXACO PLANT NUMBER

TEXACO SERVICE SYMBOL

SIZE

NUMBER

INSULATION REQUIREMENTS

TEXACO PIPING MATERIAL SERVICE SPECIFICATION

5-AA-1
5-AA-5
5-AA-6
5-AA-10
5-AA-11
5-AA-7
5-AA-8
5-AA-9

John H. Beys
11/8/73

REVISOR	DATE	REVISION	BY	CHKD	APPD
11/8/73	11/8/73	REVISED PER DRAWING 5-AA-111 REV. 0	SC	SC	SC
11/8/73	11/8/73	ADDED UTILITY STATION & HYDRANT VALVES	SC	SC	SC
11/8/73	11/8/73	ISSUED FOR CONSTRUCTION	SC	SC	SC
11/8/73	11/8/73	UPDATED TO JES AWARD ISSUED FOR APPROVAL	SC	SC	SC

SCALE: _____

DESIGNED BY: _____

DRAWN BY: _____

BECHTEL
HOUSTON

TEXACO INC.
PUGET SOUND PLANT

UTILITY PIPING & INSTRUMENT DIAGRAM
WATER SYSTEM
CATALYTIC POLYMERIZATION UNIT

Job No. _____

Drawn By. _____

Checked By. _____

BECHTEL-10095

TEXACO EST-3910

5-AA-11 8A

WA-TEX 000400

[illegible]

-  REMOVE
 RELOCATE
 NOT USED (DO NOT REMOVE)
-  DENOTES TIE-IN REVISIONS
- ### NOTES
1. REVISIONS OF MAJOR SYSTEMS ARE DESIGNATED BY THE SYMBOLS SHOWN ABOVE. MINOR REVISIONS ARE CIRCLED AND INCLUDE A TRIANGULAR REVISION MARK.
 2. PIPING SERVICE SPECIFICATIONS FOR NEW LINES ARE IN ACCORDANCE WITH GEMS J-228 TABLE 7.
 3. LINE NUMBER SUFFIXES FOR INSULATION ARE IDENTIFIED AS FOLLOWS.
- | | |
|-----|-------------------------------|
| PP | PERSONNEL PROTECTION |
| CC | COLD CONSERVATION |
| PHC | PARTIAL HEAT CONSERVATION |
| FHC | FULL HEAT CONSERVATION |
| OTC | OPERATING TEMPERATURE CONTROL |
| ST | STEAM TRACED |
| NI | NO INSULATION |



A 7/10
13A 7/10
12A 7/10
12A 7/10
12A 7/10
12A 7/10

ADDED ST TO SJ-C-52-S
REVISED PER DRAWING
S-AA-106 REV. D
UPDATED FOR JOB AWARD
ISSUED FOR APPROVAL

NO ONE

BENTEL

TEXACO INC.

PROCESS PIPING & INST. DIAGRAM
FEED PREPARATION SECTION
CATALYTIC POLYMERIZATION UNIT

5-RA-4

TO RELIEF HEADER

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

5-RA-5

CONTROL VALVE (OPEN ON AIR FAILURE)	8	SPECIAL BLIND OPERATIONAL
CONTROL VALVE (CLOSE ON AIR FAILURE)	8	ANGLE CONTROL VALVE
INSULATION STEAM TRACED PP-PERSONNEL PROTECTION	8	SPECIAL BLIND TEST

INSTRUMENT SYMBOLS	
FIELD MOUNTED	TRANSMITTER
BOARD MOUNTED	
PRESS. LINE & PNEU. CONTR.	INSTR. ELECTRICAL LEAD
INSTR. CONTROL AIRLINE	CAPILLARY TUBING

PLANT NUMBER	
INSTRUMENT IDENTIFICATION	
INSTRUMENT NUMBER	

ALL INSTRUMENTS ARE CODED IN ACCORDANCE WITH I.S.A. STANDARDS EXCEPT AS NOTED: FOR RELAYS REFER TO DWS 50-RA-4.

LINE IDENTIFICATION	
FOR LINES WHERE VELOCITIES AND PRESSURE DROP MUST BE CALCULATED	
JO-55B SIZE LINE SERIAL NO B.C. PLANT COMMODITY T.C. PLANT	
FOR LINES AND SMALLER NOT REQUIRING PRESSURE DROP CALCULATION:	
JO-55B SIZE PIPING SPECIFICATION	

PIPING SPECIFICATION	
JO-55B	100" NOM. RATING, 1/8" CORR. ALLOW.
JO-55B	150" R.E. GATES, 1/8" CORR. ALLOW.
JO-55B	150" R.E. COCKS, 1/8" CORR. ALLOW.
JO-55B	300" R.E. GATES, 1/8" CORR. ALLOW.
JO-55B	300" R.E. COCKS, 1/8" CORR. ALLOW.
JO-55B	150" R.E. COCKS, 1/8" CORR. ALLOW.

COMMODITY DESIGNATION	
EW	CONDENSER WATER
PH	PROCESS WATER
ST	STEAM & CONDENSATE
SA	SAFETY WATER

ITEM NUMBERS	
510	300" FLDG. C.T. GATE VALVE 1/8" R.P.
100	150" FLDG. C.T. PLUG VALVE 1/8" R.P.

REFERENCE DRAWINGS	
PROCESS P&ID - FEED DRY SEC. CAL. POLY. UNIT	5-RA-4
PROCESS P&ID - REACTION SEC. CAL. POLY. UNIT	5-RA-5
UTILITY P&ID - STEAM & CONDENSATE SYSTEMS	5-RA-6
UTILITY P&ID - WATER SYSTEMS	5-RA-7
UTILITY P&ID - AIR & BLOWDOWN SYSTEMS	5-RA-8
P&ID - TANKAGE & INTERCONNECTING LINES, SHUTS	5-RA-9
PILOT PLAN - CATALYTIC POLYMERIZATION UNIT	5-RA-10

NOTES

1. STEAM TRACING OF VESSEL ROOTS TO BE IN ACCORDANCE WITH DWS 50-RA-153

5-RA-4	ADD TYP. IN LINE 0-1 - ADD 5" PARTIAL BYPASS & REV. TRN. 50-CIT	UN	AD	EN	SA
5-RA-5	ADD 1" VALVE ON LINE 0-45 FOR F.C.O. P&ID. ADD 3/4" IN-107 & INDICATED STEAM TO BE SHUT OFF	UN	AD	EN	SA
5-RA-6	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-7	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-8	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-9	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-10	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA

BECHTEL CORPORATION
SAN FRANCISCO

THE TEXAS COMPANY
PUGET SOUND WORKS

PROCESS PIPING & INSTRUMENT DIAGRAM
RECOVERY SECTION
CATALYTIC POLYMERIZATION UNIT

RELOCATE
NOT USED (DO NOT REMOVE)

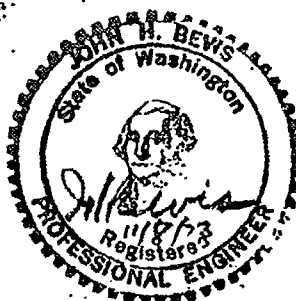
DENOTES TIE-IN NUMBERS

NOTES

1. REVISIONS OF MAJOR SYSTEMS ARE DESIGNATED BY THE SYMBOLS SHOWN ABOVE. MINOR REVISIONS ARE CIRCLED AND INCLUDE A TRIANGULAR REVISION MARK.
2. PIPING SERVICE SPECIFICATIONS FOR NEW LINES ARE IN ACCORDANCE WITH GEMS J-208 TABLE 7.
3. LINE NUMBER SUFFIXES FOR INSULATION ARE IDENTIFIED AS FOLLOWS:
PP PERSONNEL PROTECTION
CC COLD CONSERVATION
PHC PARTIAL HEAT CONSERVATION
FHC FULL HEAT CONSERVATION
OTC OPERATING TEMPERATURE CONTROL
ST STEAM TRACED
NI NO INSULATION
4. TO KEEP HYDROCARBON FROM ENTERING STEAM CONDENSATE SYSTEM, THE BALL FLOAT SHALL BE SET TO SHUT OFF FOR LIQUID OF SPECIFIC GRAVITY LESS THAN WATER.
5. INSTRUMENT STEAM TRACING SYMBOLS:
- TRACED
- TRACED & HOUSED

LINE IDENTIFICATION

1A - 0 - 2 - 5 - 312A - 1	INSULATION	2 - 1 - 1 - 1 - 1 - 1
TEXACO	SIZE	TEXACO
PL. NO.	NUMBER	PL. NO.
1 - 1 - 1 - 1 - 1 - 1	1 - 1 - 1 - 1 - 1 - 1	1 - 1 - 1 - 1 - 1 - 1



5-RA-4	ADD TYP. IN LINE 0-1 - ADD 5" PARTIAL BYPASS & REV. TRN. 50-CIT	UN	AD	EN	SA
5-RA-5	ADD 1" VALVE ON LINE 0-45 FOR F.C.O. P&ID. ADD 3/4" IN-107 & INDICATED STEAM TO BE SHUT OFF	UN	AD	EN	SA
5-RA-6	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-7	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-8	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-9	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA
5-RA-10	FOR LIST OF REV. SEE DWS 5-RA-4	UN	AD	EN	SA

BECHTEL

TEXACO INC.

PUGET SOUND PLANT

PROCESS PIPING & INST. DIAGRAM
RECOVERY SECTION
CATALYTIC POLYMERIZATION UNIT

APPROVED BY: 10005
DATE: 10-10-50

5-RA-5 18A

WA-TEX 000402

LITY LEGEND

R-OILY WATER

STEAM

1-SERVICE

NOTES

SUFFIXES FOR INSULATION
D AS FOLLOWS:
NNEL PROTECTION
CONSERVATION
AL HEAT CONSERVATION
HEAT CONSERVATION
TINO TEMPERATURE CONTROL
I TRACED & INSULATED
ULATION
IWISE SPECIFIED, THE VALVE
ALL BE BY THE CONTRACTOR

AS J-1D, PARA. 513 FOR
LOSOPHY WITH REGARDS
BE SUPPLIED BY THE
PARTICULAR ATTENTION
EN TO THE MODIFICATION
WHICH COVERS SHUTDOWN

WLL-SUBMIT A-PRECIPITATOR--
FOR-SALT-FILTER

BECHTEL-10095

TEXACO EST. 3910

SYMBOLS

EXISTING
NEW
REMOVE
RELOCATE
NOT USED - DO NOT REMOVE
DENOTES TIE-IN NUMBERS



NOTES

1. REVISION OF MAJOR SYSTEMS ARE DESIGNATED BY THE SYMBOLS SHOWN ABOVE. MINOR REVISIONS ARE CIRCLED AND INCLUDE A TRIANGULAR REVISION MARK.
2. PIPING SERVICE SPECIFICATIONS FOR NEW LINES ARE IN ACCORDANCE WITH GEMS - J-2DB, TABLE 7.
3. LINE NUMBER SUFFIXES FOR INSULATION ARE IDENTIFIED AS FOLLOWS:

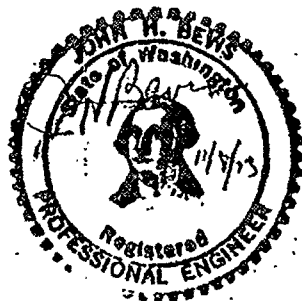
PP PERSONNEL PROTECTION
CC COLD CONSERVATION
PHC PARTIAL HEAT CONSERVATION
FHC FULL HEAT CONSERVATION
OTC OPERATING TEMPERATURE CONTROL
ST STEAM TRACED
NI NO INSULATION

4. INSTRUMENT STEAM TRACING SYMBOLS:

II-TRACED
III-TRACED & INSULATED

LINE IDENTIFICATION

1A-O-432-6"-J13A-NI
TEXACO PLANT NUMBER TEXACO SERVICE SYMBOL SIZE NUMBER INSULATION REQUIREMENTS TEXACO PIPING MATERIAL SERVICE SPECIFICATION



NOTICE
THIS DRAWING IS THE PROPERTY OF TEXACO
INC. AND IS LOANED TO YOU FOR INFORMATION
ONLY. IT IS NOT TO BE REPRODUCED OR
COPIED IN ANY MANNER WITHOUT THE
WRITTEN PERMISSION OF TEXACO INC.
IF YOU HAVE ANY QUESTIONS OR
SUGGESTIONS, PLEASE CONTACT THE
DRAWING ENGINEER OR THE PROJECT
ENGINEER.

ACO INC.

IG DEPARTMENT

TON, TEXAS

IG FLOW DIAGRAM
ARATION SECTION
MERIZATION UNIT

1- NONE

EN ASSIGNED DATE
ID NO RECORD ENTERED 1-21-72

5-RA-25

BECHTEL

HOUSTON



TEXACO INC.

PUGET SOUND PLANT



PROCESS PIPING & INSTRUMENT DIAGRAM
SAT FEED PREPARATION SECTION
CATALYTIC POLYMERIZATION UNIT



Job No
BECHTEL - 10095
TEXACO EST - 3910

Drawn By
5-RA-25

Rev

7A

WA-TEX 000403

10.2 VESSEL DRAWINGS

DRAWING

5-DC-40

WA-TEX 000405

DRAWING

5-DC-41

WA-TEX 000406

DRAWING

5-DC-42

WA-TEX 000407

DRAWING

5-DC-43

WA-TEX 000408

DRAWING

5-DC-44

WA-TEX 000409

10.3 EXCHANGERS

TABLE 10.3-1
EXCHANGER SUMMARY SHEET
CATALYTIC POLYMERIZATION UNIT PLANT 5J
ANACORTES, WASHINGTON

DATA					DESIGN			
1	Shell Data				Shell		Tube	
	No. Passes	Diam. Inches	Material	No. Passes	Temp °F	Press PSIG	Temp °F	Press PSIG
	2	15-1/4	C.S.	1	650	300	650	300
	2	12	C.S.	1	400	65	200	275
	6	19-1/4	C.S.	1	650	300	300	150

WA-TEX 000411

EXCHANGER SPECIFICATION SHEET

CUSTOMER AND PROJECT LOCATION		TEXACO INC		EXCHANGER	
PLANT		PUGET SOUND		MFR. HUGHES-ANDERSON	
EXCHANGER NO.		5J-E58		REQ. NO. E-02	
SERVICE OF UNIT		PROPANE STRIPPER		ITEM NO 13	
SIZE	12x72	TYPE	AEU	CONNECTED IN	SERIES
SURFACE PER UNIT	95	EFF. SHELLS PER UNIT	1	SURFACE PER SHELL	95
PERFORMANCE OF ONE UNIT					
SHELL SIDE			TUBE SIDE		
FLUID CIRCULATED	STEAM		PROPANE STRIPPER BTMS		
TOTAL FLUID ENTERING	LBS/HR	585	9600		
VAPOR					
LIQUID			9600		
STEAM	585				
NON-CONDENSIBLES					
FLUID VAPORIZED OR CONDENSED			3825		
STEAM CONDENSED	585				
GRAVITY-LIQUID			0.46		
VISCOSITY-LIQUID	CP		0.009 (IN) - 0.09 (OUT)		
MOLECULAR WEIGHT-VAPORS			43.3		
SPECIFIC HEAT-LIQUIDS			B.T.U./#		
LATENT HEAT-VAPORS			B.T.U./#		
TEMPERATURE IN		281	°F	112	°F
TEMPERATURE OUT		281	°F	116	°F
OPERATING PRESSURE	PSIG	35		235	
NUMBER OF PASSES		1		2	
VELOCITY			FT./SEC.	FT./SEC.	
PRESSURE DROP	ALLOW/GALC.	1.0 / 0	#/SQ.IN.	0.5 / 0.5	#/SQ.IN.
FOULING RESISTANCE	MIN.	0.0005		0.001	
HEAT EXCHANGED - BT.U./HR 540,000 M.T.D. (CORRECTED) 162					
TRANSFER RATE - SERVICE 35.1 CLEAN ACTUAL FOULING FACTOR					
CONSTRUCTION					
DESIGN PRESSURE		65	#/SQ.IN.	275	#/SQ.IN.
TEST PRESSURE		100	#/SQ.IN.	415	#/SQ.IN.
DESIGN TEMPERATURE		400	°F	200	°F
TUBES CARBON STEEL NO. 80	O.D. 3/4"	NO. 0085	LENGTH 72	PITCH 1"	Δ 4 #
SHELL CARBON STEEL	I.D. 12"		THICKNESS		
SHELL COVER CARBON STEEL			FLOATING HEAD COVER		
CHANNEL CARBON STEEL			CHANNEL COVER CARBON STEEL		
TUBE SHEETS - STATIONARY CARBON STEEL			FLOATING		
BAFFLES - CROSS CARBON STEEL	TYPE SEGMENTAL		THICKNESS		
BAFFLE - LONG	TYPE		THICKNESS		
TUBE SUPPORTS			THICKNESS		
GASKETS	METAL JACKETED ASBESTOS				
CONNECTIONS - SHELL - IN	2"	OUT	1"	RATING 150# RF	
- CHANNEL - IN	3"	OUT	3"	RATING 300# RF	
CORROSION ALLOWANCE - SHELL SIDE	1/8"		TUBE SIDE	1/8"	
CODE REQUIREMENTS	ASME SECTION VIII D1		TEMP CLASS R	SPEC. E1M7	
WEIGHTS - EACH SHELL	BUNDLE		FULL OF WATER		
NOTE INDICATE AFTER EACH PART WHETHER STRESS RELIEVED (S.R.) AND WHETHER RADIOGRAPHED (X-R)					
REMARKS -					
51					



REV.	DATE	REVISION	JOB NO.	DRWG. NO.	REV.
1	1-24-77	REVISED, ISSUED FOR CONST.	10095	DS-5-F3	1
2	2-19-77	ISSUED FOR PURCHASE			

WA-TEX 000412

EXCHANGER SPECIFICATION SHEET

1	CUSTOMER AND PROJECT LOCATION		TEXACO INC.		EXCHANGER MFR. WESTERN SUPPLY	
2	PLANT		PUGET SOUND		REQ. NO. E-03	
3	EXCHANGER NO.		5J-E57		ITEM NO. 3	
4	SERVICE OF UNIT DEPROPANIZER FEED BOTTOM EXCHANGER					
5	SIZE	15 X 240	TYPE	AES	CONNECTED IN	SERIES PARALLEL
6	SURFACE PER UNIT	473	EFF. SHELLS PER UNIT	1	SURFACE PER SHELL	473 EFF.
PERFORMANCE OF ONE UNIT						
7	FLUID CIRCULATED		SHELL SIDE		TUBE SIDE	
8	TOTAL FLUID ENTERING LBS/HR		DEPROPANIZER FEED		DEPROPANIZER BTMS.	
9	VAPOR		55,357		49,257	
10	LIQUID		55,357		49,257	
11	STEAM					
12	NON-CONDENSIBLES					
13	FLUID VAPORIZED OR CONDENSED					
14	STEAM CONDENSED					
15	GRAVITY-LIQUID	SP	0.54 (IN) - 0.496 (OUT)		0.459 (IN) - 0.514 (OUT)	
16	VISCOSITY-LIQUID	CP	0.14 (IN) - 0.1 (OUT)		0.08 (IN) - 0.11 (OUT)	
17	MOLECULAR WEIGHT		55.8		58.7	
18	SPECIFIC HEAT-LIQUIDS		B.T.U./#		B.T.U./#	
19	LATENT HEAT-VAPORS		B.T.U./#		B.T.U./#	
20	TEMPERATURE IN		100 °F		215 °F	
21	TEMPERATURE OUT		154 °F		154 °F	
22	OPERATING PRESSURE	PSIG	245		235	
23	NUMBER OF PASSES		1		2	
24	VELOCITY		FT./SEC.		4 FT./SEC	
25	PRESSURE DROP	ALLOW/GALC.	5 / 2 #/SQ.IN.		1.5 / 1.5 #/SQ.IN.	
26	FOULING RESISTANCE	MIN.	0.001		0.001	
27						
28	HEAT EXCHANGED-BTU./HR		1,850,000		M.T.D. (CORRECTED) 46	
29	TRANSFER RATE-SERVICE		24.9		CLEAN ACTUAL FOULING FACTOR	
CONSTRUCTION						
30	DESIGN PRESSURE		300 #/SQ.IN.		300 #/SQ.IN.	
31	TEST PRESSURE		450 #/SQ.IN.		450 #/SQ.IN.	
32	DESIGN TEMPERATURE		650 °F		650 °F	
33	TUBES	CARBON STEEL NO 122	O.D. 1 1/4" BWG 14	LENGTH 240"	PITCH 1"	Δ 1/8" ◇
34	SHELL	CARBON STEEL	I.D. 15 1/4"	THICKNESS		
35	SHELL COVER	CARBON STEEL	FLOATING HEAD COVER	CARBON STEEL		
36	CHANNEL	CARBON STEEL	CHANNEL COVER	CARBON STEEL		
37	TUBE SHEETS	STATIONARY CARBON STEEL	FLOATING	CARBON STEEL		
38	BAFFLES	CROSS CARBON STEEL	TYPE SEGMENTAL	THICKNESS		
39	BAFFLE	LONG	TYPE	THICKNESS		
40	TUBE SUPPORTS		THICKNESS			
41	GASKETS	METAL JACKETED ASBESTOS				
42	CONNECTIONS-SHELL-IN	3"	OUT 3"	RATING 300# RF		
43	-CHANNEL-IN	4"	OUT 4"	RATING 300# RF		
44	CORROSION ALLOWANCE-SHELL SIDE	1/8"	TUBE SIDE	1/8"		
45	CODE REQUIREMENTS	ASME SECTION VIII DIV 1		ITEMA GLASS R	SPEC. EIM7	
46	WEIGHTS-EACH SHELL	BUNDLE	FULL OF WATER			
47	NOTE INDICATE AFTER EACH PART WHETHER STRESS RELIEVED (S.R.) AND WHETHER RADIOGRAPHED (X-R)					
48	REMARKS - (1) BAFFLE SPACING 5 1/2". BAFFLE CUT 23%					
51						

REV.	DATE	REVISION	JOB NO.	DRWG NO.	REV.
1	1-28-75	REVISED: ISSUED FOR CONSTR.	10095	DS-E-E-1	1
2	10-11-75	ISSUED FOR PURCHASE			

FORM H. 138 PART B 9/66

WA-TEX 000413

EXCHANGER SPECIFICATION SHEET

CUSTOMER AND PROJECT LOCATION		TEXACO INC		EXCHANGER MFR. WESTERN - SUPPLY	
PLANT		PUGET SOUND		REV. NO. E-03	
EXCHANGER NO.		5J-E59		ITEM NO 4	
SERVICE OF UNIT DEPROPANIZER BOTTOMS COOLER					
SIZE	19 x 240	TYPE	AES	CONNECTED IN	SERIES PARALLEL
SURFACE PER UNIT	748	EFF. SHELLS PER UNIT	1	SURFACE PER SHELL	748
PERFORMANCE OF ONE UNIT					
		SHELL SIDE		TUBE SIDE	
FLUID CIRCULATED		DEPROPANIZER BTMS		COOLING WATER	
TOTAL FLUID ENTERING	LBS/HR	49,257		73,000	
VAPOR					
LIQUID		49,257		73,000	
STEAM					
NON-CONDENSIBLES					
FLUID VAPORIZED OR CONDENSED					
STEAM CONDENSED					
GRAVITY-LIQUID	SP	0.514 (IN) - 0.554 (OUT)			
VISCOSITY-LIQUID	CP	0.11 (IN) - 0.145 (OUT)			
MOLECULAR WEIGHT-VAPORS					
SPECIFIC HEAT-LIQUIDS		B.T.U./#		B.T.U./#	
LATENT HEAT-VAPORS		B.T.U./#		B.T.U./#	
TEMPERATURE IN		154 °F		76 °F	
TEMPERATURE OUT		100 °F		100 °F	
OPERATING PRESSURE	PSIG	230		40	
NUMBER OF PASSES		1		6	
VELOCITY		FT./SEC.		4.84 FT./SEC	
PRESSURE DROP	ALLOW/CALC.	4 / 4 #/SQ.IN.		12 / 12 #/SQ.IN.	
FOULING RESISTANCE	MIN.	0.001		0.003	
HEAT EXCHANGED - BTU./HR		1,750,000		M.T.D. (CORRECTED) 29.8	
TRANSFER RATE - SERVICE		78.5		CLEAN ACTUAL FOULING FACTOR	
CONSTRUCTION					
DESIGN PRESSURE		300 #/SQ.IN.		150 #/SQ.IN.	
TEST PRESSURE		450 #/SQ.IN.		225 #/SQ.IN.	
DESIGN TEMPERATURE		650 °F		300 °F	
TUBES	IN. ADM	NO. 193	O.D. 3/4	SWG. 16	LENGTH 240" PITCH 1" 4#20
SHELL	CARBON STEEL	I.D. 19 1/4"	THICKNESS		
SHELL COVER	CARBON STEEL	FLOATING HEAD COVER CARBON STEEL			
CHANNEL	CARBON STEEL	CHANNEL COVER CARBON STEEL			
TUBE SHEETS	STATIONARY NAVAL ROLLED BRASS	FLOATING NAVAL ROLLED BRASS			
BAFFLES	CROSS CARBON STEEL	TYPE SEGMENTAL (1) THICKNESS			
BAFFLE	LONG	TYPE THICKNESS			
TUBE SUPPORTS		THICKNESS			
GASKETS	METAL JACKETED ASBESTOS				
CONNECTIONS - SHELL - IN	4"	OUT 4"	RATING 300 * RF		
- CHANNEL - IN	4"	OUT 4"	RATING 150 * RF		
CORROSION ALLOWANCE - SHELL SIDE	1/8"	TUBE SIDE 1/8"			
CODE REQUIREMENTS	ASME SECTION VIII DIV 1	TENSILE GLASS R		SPEC. EIM7	
WEIGHTS - EACH SHELL	BUNDLE	FULL OF WATER			
NOTE INDICATE AFTER EACH PART WHETHER STRESS RELIEVED (S.R.) AND WHETHER RADIOGRAPHED (X-R)					
REMARKS - (1) BAFFLE SPACING 5". BAFFLE CUT 10%					

FORM M-158 PART B 9/56



REV.	DATE	REVISION	BY	CHKD	JOB NO.	DRWG. NO.	REV.
1	5-24-73	REVISED, ISSUED FOR CONST	ML	ML	10095	DS-5-E-2	1
2	10-11-73	ISSUED FOR PURCHASE	ML	ML			

WA-TEX 000414

10.4 PUMPS

TABLE 10.4-1
UGAL PUMP SUMMARY SHEET
POLYMERIZATION UNIT PLANT 5J
MACORTES, WASHINGTON

DRIVER DATA			
<u>RPM</u>	<u>Rated H.P.</u>	<u>Type</u>	<u>Full Load Amps</u>
3600	15	Motor	

WA-TEX 000416

CENTRIFUGAL PUMP DATA SHEET

APPLICABLE TO: PROPOSALS ☐ PURCHASE ☒ AS BUILT ☐
NOTE: () INDICATES INFORMATION TO BE COMPLETED BY PURCHASER;
☐ BY MANUFACTURER

EXISTING PUMP

JOB NO. 10095 ITEM NO. 5J-G-3
PURCHASE ORDER NO. 10095-G-02
REQUISITION NO. 10095-G-02
INQUIRY NO. _____
DATE _____ REVISION _____

FOR TEXACO, INC. SITE PUGET SOUND
UNIT CAT. POLY SERVICE WATER WASH
NO. PUMPS REQ'D 1 NO. MOTORS REQ'D 1 ITEM NO. 55-GM-3 PROVIDED BY EXISTING MTD BY _____
NO. TUMMERS REQ'D _____ ITEM NO. _____ PROVIDED BY _____ MTD BY _____
PUMP MFR. WILSON-SNYDER SIZE AND TYPE 1 1/2 x 2 - 2 1/2 SERIAL NO. 6541

OPERATING CONDITIONS, EACH PUMP				PERFORMANCE	
LIQUID <u>WATER</u>	U.S. GPM at FT. HOR. <u>120</u>	RATED <u>134</u>	PROPOSAL CURVE NO. <u>29-190-300</u>		
	DISCH. PRESS. PSIG <u>307</u>		RPM <u>3550</u> NPSHR (WATER) <u>11/4</u>		
PT. F. HOR. <u>80</u> MAX.	SUCT. PRESS. PSIG MAX.	RATED <u>35</u>	EFF. <u>52</u> BHP RATED <u>42.39</u>		
SP. GR. at PT. <u>1.0</u>	DIFF. PRESS. PSI <u>272</u>		MAX. BHP RATED MAP <u>50.83</u>		
VAP. PRESS. at PT. PSIA <u>0</u>	DIFF. HEAD, FT. <u>62.8</u>		MAX. HEAD RATED MAP		
VIS. at PT. S.W. <u>CP</u>	NPSHA, FT. <u>730</u>		MIN. CONTINUOUS GPM		
CORR./EROS. CAUSED BY _____	HYD. HP <u>22.09</u>		ROTATION (VIEWED FROM C/P16 END)		

CONSTRUCTION					SHOP TESTS	
NOZZLES	SIZE	RATING	FACING	LOCATION	☐ NON-WIT. PERF.	☐ WIT. PERF.
SUCTION	<u>2</u>	<u>300</u>	<u>RF</u>	<u>TOP</u>	☐ NON-WIT. HYDRO	☐ WIT. HYDRO
DISCHARGE	<u>1 1/2</u>	<u>300</u>	<u>RF</u>	<u>TOP</u>	☐ NPSH REQ'D	☐ WIT. NPSH
CASE MOUNT: ☐ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERT. (TYPE) _____					☐ SHOP INSPECTION	
SPLIT: ☐ AXIAL ☐ RAD. TYPE VOLUTE ☐ SGL ☐ DBL ☐ DIFFUSER					☐ OHSMAINT. & INSP. AFTER TEST	
PRESS: ☐ MAX. ALLOW. _____ PSIG F: ☐ HYDRO TEST _____ PSIG					☐ OTHER <u>NONE</u>	
CONNECT: ☐ VENT ☐ FRAM ☐ BAGE						
IMPELLER DIA. <u>9"</u> ☐ MAX. <u>10 1/2"</u> ☐ TYPE <u>CLOSED</u>						
MOUNT: ☐ BETWEEN BRGS ☐ OVERHUNG ☐ WEAR. PG. OMM/CLRMG						
BEARINGS-TYPE: ☐ RADIAL ☐ THRUST						
LUBE: ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☐ FLINGER ☐ PRESSURE						
COUPLING: ☐ MRF ☐ MOHEL						
DRIVER HALF MTD BY: ☐ PUMP MFR ☐ DRIVER MFR ☐ PURCHASER						
PACKING: ☐ MFR & TYPE _____ ☐ SIZE/NO. OF RINGS _____						
MECH. SEAL: ☐ MFR & MODEL _____ API CLASS. CODE _____						
☐ MFR CODE _____						

AUXILIARY PIPING		MATERIALS	
☐ C.W. PIPE PLAN	☐ CU: ☐ S.S.: ☐ TUBING: ☐ PIPE	API CASE/TWIN CLASS <u>GEMS-P-2M7</u>	
☐ TOTAL COOLING WATER REQ'D. GPM	☐ SIGHT FL. REQ'D	GROUP <u>2A2</u>	
☐ PACKING COOLING INJECTION REQ'D: ☐ TOTAL GPM ☐ PSIG		CASE <u>CI</u>	
☐ SEAL FLUSH PIPE PLAN	☐ C.S. ☐ S.S. ☐ TUBING ☐ PIPE	SHAFT <u>4140-UT</u>	
☐ EXTERNAL SEAL FLUSH FLUID	☐ GPM ☐ PSIG		
☐ AUXILIARY SEAL PLAN	☐ C.S. ☐ S.S. ☐ TUBING ☐ PIPE		
☐ AUX. SEAL QUENCH FLUID			
		BASEPLATE: ☐	
		VERTICAL PUMPS	
		PIT OR SUMP DEPTH ☐	
		MIN. SUBMERSION REQ'D. ☐	
		COLUMN PIPE: ☐ FLANGED ☐ THREADED	
		LINE SHAFT: ☐ OPEN ☐ ENCLOSED	
		BRGS: ☐ DOWN ☐ LINE SHAFT	
		BRG. LUBE: ☐ WATER ☐ OIL ☐ GREASE	
		FLOAT & ROD: ☐ C.S. ☐ S.S. ☐ BRZ ☐ NONE	
		FLOAT SWITCH ☐	
		PUMP THRUST, LB ☐ UP ☐ DOWN	
		APPROX. WT. PUMP & BASE	
		MOTOR	TURBINE

MOTOR DRIVER			
HP _____	RPM _____	FRAME _____	VOLTS/PHASE/CYCLES _____
MFR _____	BEARINGS _____	LUBE _____	
TYPE _____	INSUL _____	FULL LOAD AMPS _____	
ENC _____	TEMP. RISE, C _____	LOCKED ROTOR AMPS _____	
☐ VHS ☐ VSS	VERT. THRUST CAP. LB _____	SERVICE FACTOR _____	

API STANDARD 610 GOVERNS UNLESS OTHERWISE NOTED. EXISTING PUMP MODIFIED FOR ABOVE SERVICE - NEW IMPELLER & WEAR RINGS

FORM NO. 130 (REVISED APRIL 71)



NO.	DATE	ISSUED FOR PURCHASE	ISSUED FOR QUOTATION	JOB NO.	DRAWING NO.	REV.
1	12-4-72	ISSUED FOR PURCHASE		10095	DS-5-G-2	1
0	11-10-72	ISSUED FOR QUOTATION				
SHEET 1 OF 1						

WA-TEX 000417

CENTRIFUGAL PUMP DATA SHEET

APPLICABLE TO: PROPOSALS ☐ PURCHASE ☐ AS BUILT ☐
 NOTE: () INDICATES INFORMATION TO BE COMPLETED BY PURCHASER:
☐ BY MANUFACTURER

JOB NO. 10095 ITEM NO. 5J-962/A
 PURCHASE ORDER NO. _____
 REQUISITION NO. 10095-601
 INQUIRY NO. _____
 DATE _____ REVISION _____

FOR TEXACO INC. SITE PUGET SOUND
 UNIT CATALYTIC POLYMERIZATION SERVICE DEPROPANIZER FEED BYPASS
 NO. PUMPS REQ'D 2 NO. MOTORS REQ'D 2 ITEM NO. 5J-962/A PROVIDED BY PUMPER MTD BY PUMPER
 NO. TURBINES REQ'D — ITEM NO. — PROVIDED BY — MTD BY —
 PUMP MFR. BYRON JACKSON SIZE AND TYPE 12X22X10 1/2 H-5T SERIAL NO. —

OPERATING CONDITIONS, EACH PUMP				PERFORMANCE	
LIQUID <u>C₃/C₄</u>	U.S. GPM at PT. NOR. <u>65</u>	RATED	PROPOSAL CURVE NO. <u>2424-J</u>		
	DISCH. PRESS. PSIG <u>327</u>		RPM <u>3550</u> NPSHR (WATER) <u>6</u>		
PT. F. NOR. <u>100</u> MAX.	SUCT. PRESS. PSIG MAX. <u>330</u>	RATED <u>250</u>	EFF. <u>38%</u> BHP RATED <u>7.7</u>		
SP GR. at PT. <u>0.475</u>	DIFF. PRESS. PSI <u>77</u>		MAX. BHP RATED IMP <u>13.0</u>		
VAP. PRESS. at PT. PSIA <u>232</u>	DIFF. HEAD. FT. <u>376</u>		MAX. HEAD RATED IMP <u>400</u>		
VIS. at PT. Ssu <u>CP-0.1</u>	NPSHA. FT. <u>> 30</u>		MIN. CONTINUOUS GPM <u>15</u>		
CORR./EROS. CAUSED BY <u>—</u>	HYD. HP <u>—</u>		ROTATION (VIEWED FROM CPLG END) <u>CCW</u>		

CONSTRUCTION					SHOP TESTS	
NOZZLES	SIZE	RATING	FACING	LOCATION	☒ NON-WIT. PERF.	☐ WIT. PERF.
SUCTION	<u>2</u>	<u>300#</u>	<u>RF</u>	<u>END</u>	☐ NON-WIT. HYDRO	☒ WIT. HYDRO
DISCHARGE	<u>1 1/2</u>	<u>300#</u>	<u>RF</u>	<u>TOP</u>	☐ NPSH REQ'D.	☐ WIT. NPSH

CASE MOUNT: ☒ CENTERLINE ☐ FOOT ☐ BRACKET ☐ VERT. (TYPE) _____
 SPLIT: ☐ AXIAL ☒ RAD. TYPE VOLUTE ☒ SBL ☐ DBL ☐ DIFFUSER
 PRESS: ☐ MAX. ALLOW. 667 PSIG 60 F: ☐ HYDRO TEST 1000 PSIG
 CONNECT: ☒ VENT ☒ DRAIN ☐ GAGE
 IMPELLER DIA. ☐ CRATED 9 1/2 ☐ MAX. 10 1/2 ☐ TYPE CLOSED
 MOUNT: ☐ BETWEEN BRGS ☒ OVERHUNG ☐ WEAR RG. DIAM./CLRNC. 0.020
 BEARINGS-TYPE: ☐ RADIAL ND3210LR ☐ THRUST ND-453094
 LUBE: ☐ RING OIL ☐ FLOOD ☐ OIL MIST ☒ FINGER ☐ PRESSURE
 COUPLING: ☐ MRF EAST ☐ MODEL B
 DRIVER HALF MTD BY: ☒ PUMP MFR ☐ DRIVER MFR ☐ PURCHASER
 PACKING: ☐ MFR & TYPE _____ ☐ SIZE/NO. OF RINGS _____
 MECH. SEAL: ☐ MFR & MODEL EW-08 AM CLASS CODE BSTFJ
☐ MFR CODE QB-2125-5D4N

AUXILIARY PIPING		MATERIALS	
☐ C.W. PIPE PLAN <u>—</u>	☐ CU: ☐ S.S.: ☐ TUBING: ☐ PIPE	API CASE/TNM CLASS <u>—</u>	
☐ TOTAL COOLING WATER REQ'D. GPM <u>0</u>	☐ TIGHT F.I. REQ'D. _____	GEMS P-2M7	
☐ PACKING COOLING INJECTION REQ'D: ☐ TOTAL GPM ☐ PSIG		GEMS P-2A1	
☐ SEAL FLUSH PIPE PLAN <u>12</u> X.C.S. ☐ S.S. ☐ TUBING ☒ PIPE <u>50K 5CH-80 WELD</u>			
☐ EXTERNAL SEAL FLUSH FLUID _____	☐ GPM ☐ PSIG		
☐ AUXILIARY SEAL PLAN _____	☐ O.C.S. ☐ S.S. ☐ TUBING ☐ PIPE		
☐ AUX. SEAL QUENCH FLUID <u>WATER</u>	<u>QUENCH CONN REQ'D</u>		

MOTOR DRIVER		VERTICAL PUMPS	
HP <u>15</u>	RPM <u>3600</u> FRAME <u>254T</u> VOLTS/PHASE/CYCLES <u>480-3-60</u>	PIT OR SUMP DEPTH <u>—</u>	
MFR <u>AC</u>	BEARINGS <u>BALL</u> LUBE <u>GRS</u>	MIN. SUBMERGENCE REQ'D. <u>—</u>	
TYPE <u>HORIZ</u>	INSUL. _____ FULL LOAD AMPS _____	COLUMN PIPE: ☐ FLANGED ☐ THREADED	
ENC <u>TEFC</u>	TEMP RISE C. <u>80</u> LOCKED MOTOR AMPS _____	LINE SHAFT: ☐ OPEN ☐ ENCLOSED	
☐ VHS ☐ VSS	VERT. THRUST CAP. LB. _____ SERVICE FACTOR _____	BRGS: ☐ BOWL ☐ LINE SHAFT	
		BRG. LUBE ☐ WATER ☐ OIL ☐ GREASE	
		FLOAT & ROD ☐ C.S. ☐ S.S. ☐ BRZ ☐ NONE	
		FLOAT SWITCH ☐ _____	
		PUMP THRUST. LB ☐ UP ☐ DOWN	
		APPROX. WT. PUMP & BASE <u>600</u>	
		MOTOR <u>252</u> TURBINE	

API STANDARD 610 GOVERNS UNLESS OTHERWISE NOTED.

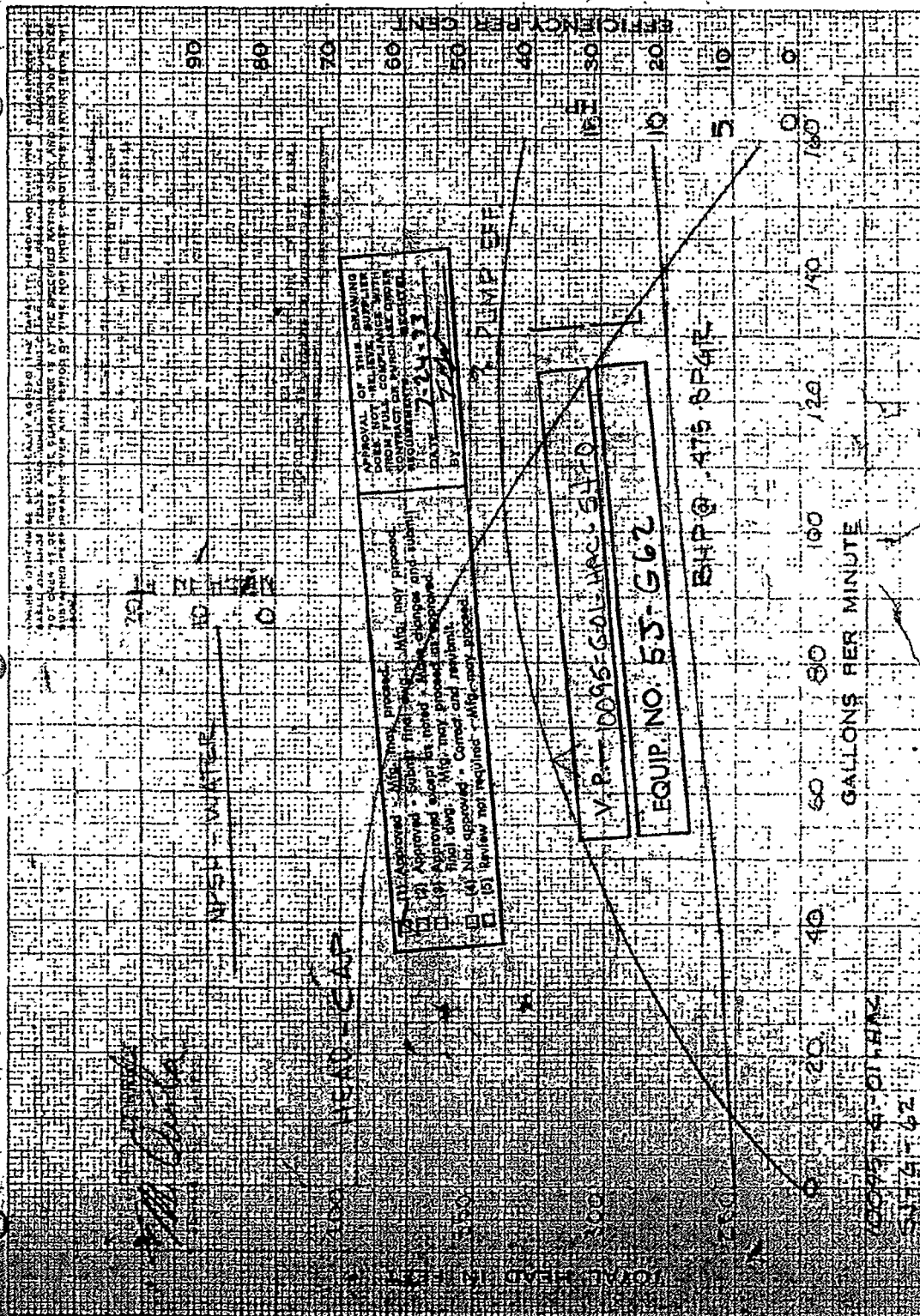
FORM NO 130 (REVISED APRIL 71)



NO.	DATE	ISSUED FOR	ISSUED FOR	JOB NO.	DRAWING NO.	REV.
1	12/16/72	ISSUED FOR PURCHASE	VT	10095	05-55-Q-1	1
0	10-72	ISSUED FOR QUOTATION				
					SHEET 1 OF 1	

WA-TEX 000418

BYRON JACKSON



2002 x 10 H 53	RPM	3200	9/2	1-33750-1
----------------	-----	------	-----	-----------

☒	(1) Approved - Pkg. may be used
☒	(2) Approved - Subject line only
☒	(3) Approved subject as noted - Note: Subject line only
☒	(4) Not Approved - Note: Not Approved
☒	(5) Rejected and Rejected - Note: Rejected

[illegible]

10.5 INSTRUMENTS

TABLE 10.5-1
FLOW ELEMENT SUMMARY SHEET
CATALYTIC POLYMERIZATION UNIT PLANT 5J
ANACORTES, WASHINGTON

<u>Flow Element No.</u>	<u>Service</u>	<u>Orifice Size</u>	<u>Line Size</u>	<u>Meter Coefficient</u>
5FE-19	Btms. Cooler Outlet	2.132	3" Sch 40	40 BPH
5FE-200	Amine to 5J-C57	1.978	3" Sch 40	15 BPH
5FE-201	Caustic to 5J-C59	1.238	2" Sch 40	8 BPH
5FE-205	Deprop. Feed Bypass	1.123	2" Sch 40	8 BPH
5FE-206	Stm. to 5J-E58	1.959	3" Sch 40	100#/Hr
5FE-207	Deprop. Reflux	0.901	2" Sch 40	4 BPH
5FE-208	Stripper Vapor Outlet	1.923	3" Sch 40	4000 SCFH

TABLE 10.5-2
RELIEF VALVE SUMMARY SHEET
CATALYTIC POLYMERIZATION UNIT PLANT 5J
ANACORTES, WASHINGTON

<u>Tag No.</u>	<u>Service</u>	<u>Size</u>	<u>Set P.ess</u>
SPSV-101	5J-C57	2" x 3"	310 PSIG
SPSV-102	5J-C58	"	"
SPSV-103	5J-C59	"	"
SPSV-104	5J-C60	"	"
SPSV-105	5J-C61	1-1/2" x 2"	260 PSIG
SPSV-107	5J-E5	3/4" x 1"	75 PSIG
SPSV-220	5J-E58	1-1/2" x 3"	65 PSIG