conoco

Interoffice Communication

To	M. L. Ashby
From	S. W. Sommer
Date	May 22, 1984
Subject	R-101 TEMPERATURE CONTROL DESIGN NO. 202-100-584-SWS REVIEW ISSUE - Return Comments By June 8, 1984

LAST

[redacted]	VMF	[redacted]
DLD	[redacted]	SWS
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Attached is a class "A" design for the installation of a cooling water recirculation pump, a temperature controller and valve, and associated piping to control the temperature at the top of Direct Chlorination Reactor R-101 at 55°C. Following the March, 1984, turnaround the temperature at the top of R-101 was 44°C, due to the installation of a new, clean H-101 tube bundle. However, at this low temperature over 2500 ppm of 1,1,2-trichloroethane are produced in R-101, six times the maximum desired concentration. The new cooling water recirculation and control system will allow the temperature to be maintained at 55°C, where the concentration of 1,1,2-trichloroethane will be 400 ppm or less.

The temperature in R-101 is presently controlled by cutting the flow of cooling water to H-101 until the desired temperature in R-101 is achieved. Although the 1,1,2-trichloroethane concentration is reduced, the velocity of cooling water through H-101 is also reduced. At the lower cooling water velocities, the tubes in H-101 are more susceptible to severe fouling, pitting, and corrosion on the cooling water side than if the full flow of cooling water is maintained. It has been necessary to completely retube H-101 every three years at a total cost of $214,000. By recirculating a portion of the warm cooling water return, the temperature in R-101 can be maintained without reducing the flow of cooling water to H-101. By maintaining the maximum cooling water velocity in H-101, the shell side H-101 would foul and corrode less severely, thereby prolonging its life. This recirculation system potentially could extend the life of H-101 from three to four years, thus saving $17,500/yr. in average annual maintenance costs. Severe fouling in the past has limited the cooling capacity of H-101 to the point where full rates could not be maintained during the hot summer months. This project will help reduce the fouling in H-101, thereby helping to maintain the maximum possible cooling capacity of H-101 during the summer months.

A portion of the H-101 cooling water return will be recirculated to the H-101 cooling water supply by H-101 Cooling Water Recirculation Pump, P-1. If not all of the recirculated water is necessary to maintain 55°C in R-101, some of the P-1 discharge will be routed through R-101 Temperature Control Valve TCV-1 back to the H-101 cooling water return.

I feel that a variable speed motor and thus variable flow pump deserves further investigation. The TIC could still be used but the 8" CV would be eliminated. Talk to VMF for further info. Mac.

CWH 000008860

By copy of this design to J. R. Holcomb, a cost estimate for budget purposes is requested. Tie-ins should be made during the First Quarter 1985 turnaround. If there are any questions, please call me at 5058.

Scott W. Sommer
Process Engineer

Approved by D. L. Davis
D. L. Davis
Sr. Process Engineer

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cc:
RAC-JWW-RB-JRH(4)-MLA(4)-MCM-CRH(3)-SRA-PLF-DLD-JGC-PE

—Will savings in maintenance offset operating cost (electricity)?

DESIGN BASIS

In February, 1984, Direct Chlorination Reactor Cooler H-101 developed a tube leak, caused by severe pitting and corrosion of the tubes on the cooling water side. The tubes were also badly fouled. Because other cooling water exchangers had not experienced such severe damage, the problem in H-101 could be attributable to very low cooling water velocities through the exchanger. The design flow velocity through H-101 is only 0.628 ft/sec. at 7,700 gpm, whereas good exchanger design would have called for 3 ft./sec. (minimum).

H-101 was retubed in February, 1984. Following retubing, the efficiency of H-101 increased and the EDC temperature in R-101 decreased. The temperature in the top of R-101 was only 44°C following the startup after the March, 1984, turnaround. At this temperature, the production of 1,1,2-trichloroethane in R-101 increased by 2100 ppm, from 400 ppm to over 2500 ppm. (See Figure 1). The temperature in R-101 was increased slowly by approximately 1°C/day until the 1,1,2-trichloroethane concentration decreased. The 1,1,2-trichloroethane concentration did decrease back to 400 ppm, at an R-101 top temperature of approximately 55°C (see Figure 2). Therefore, to avoid EDC product losses, R-101 must be run in the vicinity of 55°C. At the 45°C operation, 333 lbs./hr. of EDC production was lost due to conversion to 1,1,2-trichloroethane, based on an EDC production rate of 158.6M lbs./hr. (1.218MMM lbs./yr.). Operation of R-101 at higher temperatures (greater than 55-58°C) will moderately increase the amount of EDC vented from Crude EDC Tank T-101 to the incinerator (increase from 37.5 to about 45 lbs./hr.) while causing only a slight reduction in 1,1,2-trichloroethane concentration in R-101 (decrease from 400 to approximately 375 ppm) based on actual operating data taken during April and May, 1984. Therefore, to minimize total EDC losses, R-101 will be operated at about 55-58°C.

Presently, the temperature in R-101 is controlled by regulating the cooling water flow rate. An 18" butterfly valve on the H-101 cooling water supply is used to throttle the cooling water flow. For example, with a clean exchanger and 75°F ambient temperatures, (cooling water temperature approximately 82°F) only 75% of the design cooling water flow rate is needed. This only compounds the velocity problem through H-101. Operating for long periods of time with the cooling water valve pinched back is believed to have been the cause for the latest H-101 corrosion problems and tube failure. Adequate temperatures in R-101 plus maintaining the maximum cooling water flow rate through H-101 is necessary to insure the maximum life of the tube bundle.

I thought the corrosion was on the process side?

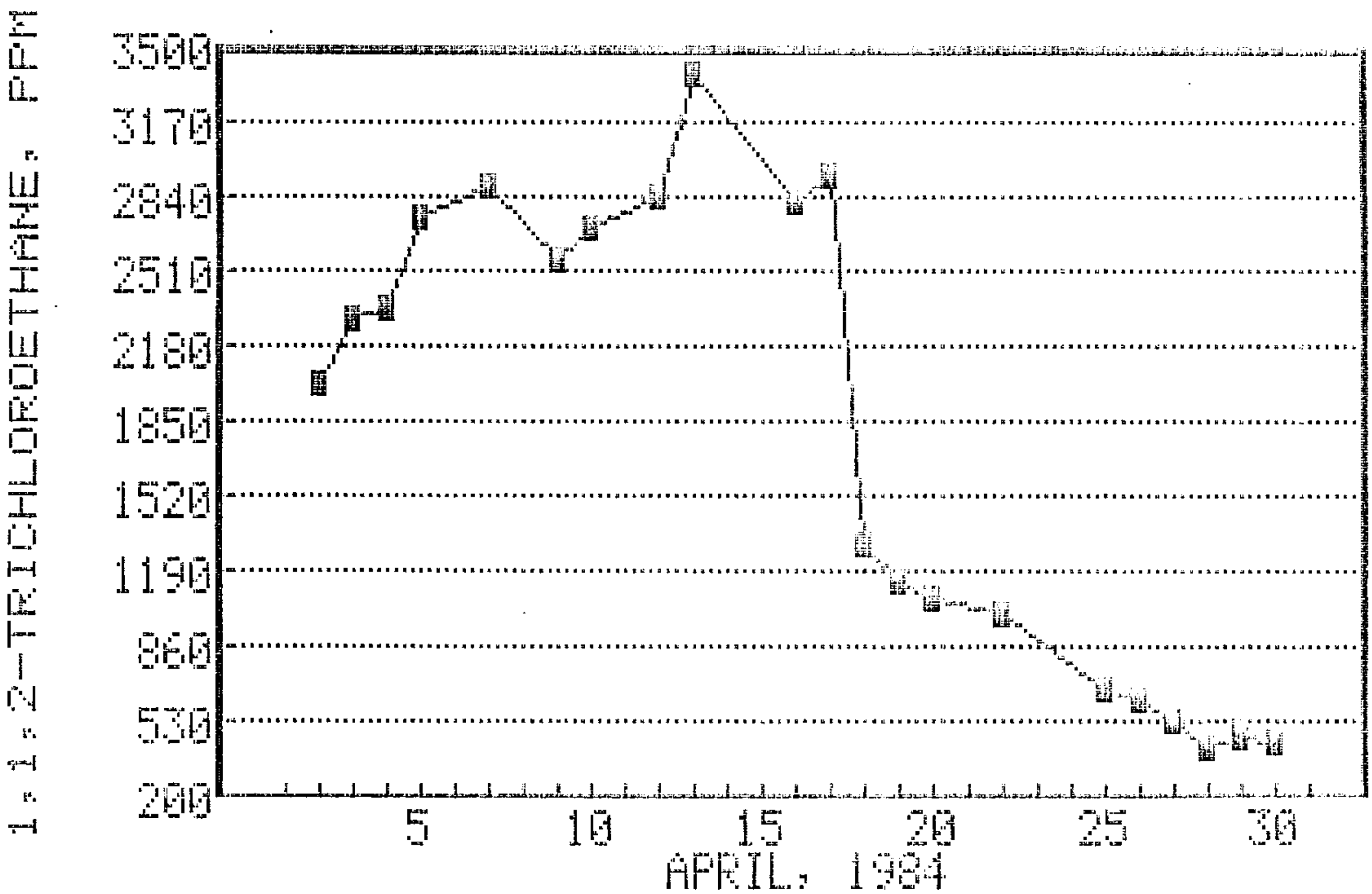
This design will provide for an H-101 Cooling Water Recirculation Pump to recycle up to 3500 gpm of the H-101 cooling water back through the exchanger. Mixing this warmer cooling water return with fresh cooling water will give a warmer cooling water supply to H-101. The warmer cooling water supply will cause a decrease in the heat transfered in H-101, resulting in a higher temperature in R-101, as desired, without reducing the velocity through H-101.

If all 3500 gpm of cooling water need not be recycled to maintain 55°C in the top of R-101, R-101 Temperature Control Valve will open to allow some of the cooling water to be routed back to the cooling water return line. During the hottest

summer months when maximum cooling is required, it may be possible to shut the H-101 Cooling Water Circulation Pump off to save energy. A heat and material balance for the recycle system is shown in Table I.

Installing this recirculation system could extend the life of H-101 from three to four (or more) years. Increasing the life of H-101 by one year will save an average of $17,500/yr. in maintenance costs, based on a cost of $214,000 to retube H-101 once.

FIGURE 1--CONC. OF 1,1,2-TRI IN R-101



CWH 000008864

FIGURE 2--TOP TEMPERATURE IN R-101

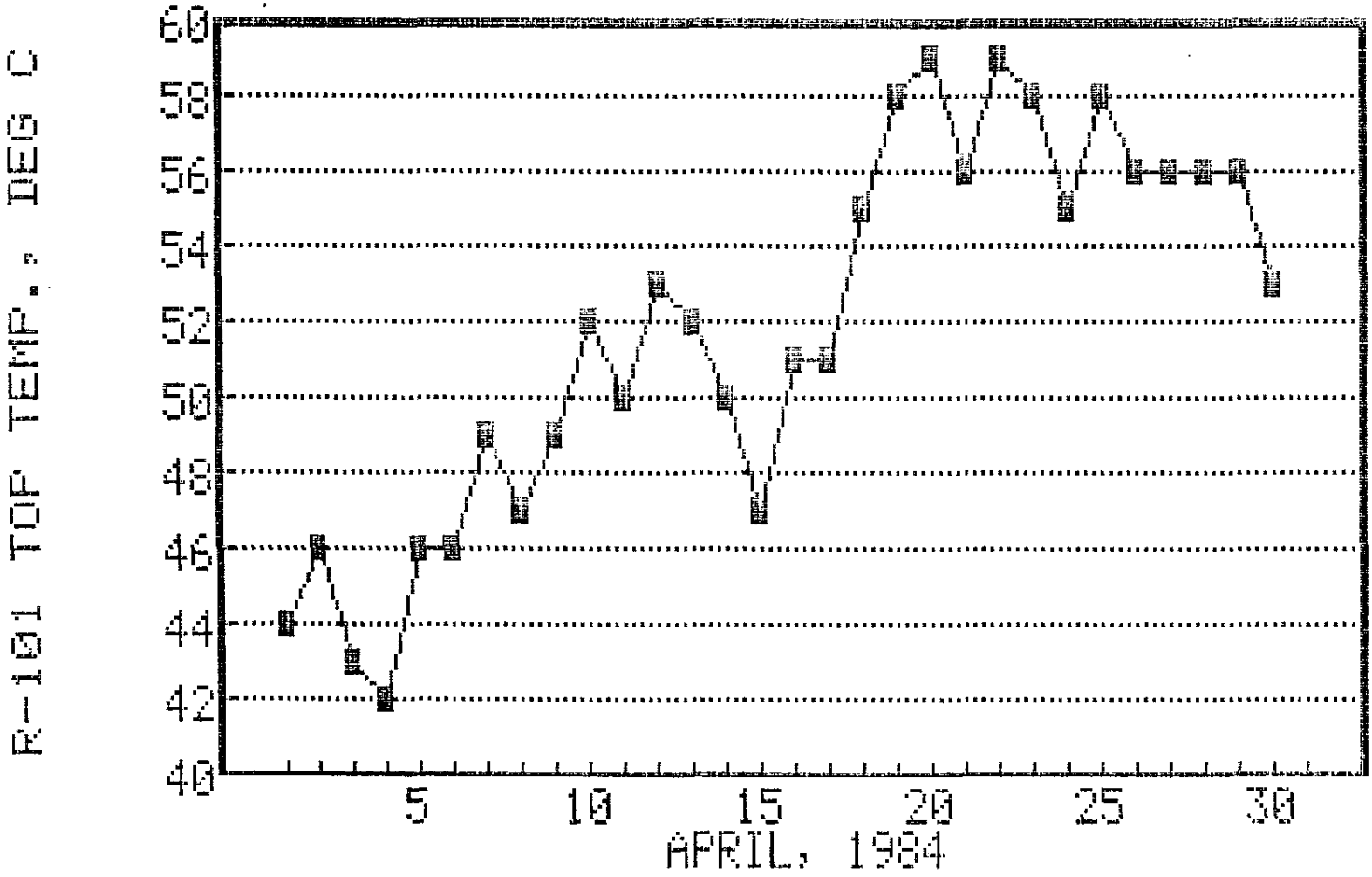


TABLE I.

H-101 Cooling Water
Recirculation Heat and Material Balance

Recirculation Rate, GPM (1)	CW Supply Temp., °F (2)	Total Flow, GPM (3)	Heat Transfer MMBTU/Hr. (4)
0	82	7705	57.9
500	83	7705	54.1
1000	84	7705	50.2
1500	85	7705	46.3
2000	86	7705	42.5
2500	87	7705	38.6
3000	88	7705	34.7
3500	89	7705	30.9

Notes

1) Recirculation rate is controlled by R-101 Temperature Control Valve, TCV-1.
2) The cooling water supply is made up of fresh cooling water and recirculation cooling water.
3) Based on the full design flow rate.
4) Based on a fresh cooling water temperature of 82°F, a constant heat transfer coefficient of 65.5 BTU/hr-Ft^2-°F, and a heat exchange area of 22,633 Ft^2, and a constant recirculation temperature of 97°F.

PROCESS DESCRIPTION

Cooling water will be circulated through Direct Chlorination Reactor Cooler H-101 at a rate of 7700 gpm. Of this rate, 3500 gpm will be recirculated by H-101 Cooling Water Recirculation Pump P-1. Warm cooling water return will be diverted to the P-1 suction line 10"-WH-1. The discharge of P-1 will be at a pressure of 75 psig. The recirculation water will then re-enter the H-101 cooling water supply line through line 8"-WH-3. Some of the P-1 discharge will be routed through line 8"-WH-2 back into the H-101 cooling water return line. The flow rate through line 8"-WH-2 will be regulated by R-101 Temperature Control Valve, TCV-1. TCV-1 will receive its control signal from Provox controller TIC-1, which will be set at 55°C. Control will be based on the temperature at the top of R-101 (see Figure 2).

Energy Impact Statement

This project will have very little effect on the total energy consumption of the VCM Plant. H-101 Cooling Water Circulation Pump P-1 will consume 0.2863MM KWH/yr. (2,863MM BTU/yr), or an increase of 0.083% in total plant energy consumption on the CMA basis. The Process Design Energy Checklist was completed and is included with this design.

Environmental Impact Statement

This project will have no effect on the environment.

Safety & Health Impact Statement

This project will have little effect on plant safety and health. Because of the large size of H-101 and the magnitude of the task to remove the exchanger, replacing H-101 less frequently will have a positive impact on safety. The Process Design Safety Checklist was completed and is included with this design.

VCM PLANT

PROCESS DESIGN ENERGY CHECK LIST

DESIGN NO: 202-100-584-SOS

Legend

✓	Item verified and action taken
OK	Item verified but no action required
NF	Item verified but not economically feasible
___	No action necessary

I. INSULATION

The economical insulation thickness was calculated and specified for the following equipment:

A. Permanent Insulation	Item No./Thickness(inches)			B. Reusable Insulation	Item No./Thickness(inches)		
1. Tank	___/___	___/___	___/___	1. Tank	___/___	___/___	___/___
2. Vessel	___/___	___/___	___/___	2. Vessel	___/___	___/___	___/___
3. Heat Exchangers	___/___	___/___	___/___	3. Heat Exchangers	___/___	___/___	___/___
4. Piping*	8-WH/O	___/___	___/___	4. Piping*	___/___	___/___	___/___
	10-WH/O	___/___	___/___		___/___	___/___	___/___
	___/___	___/___	___/___		___/___	___/___	___/___
5. Control Valves	FCV-1/O	___/___	___/___	5. Control Valves	___/___	___/___	___/___
6. Process Valves	___/___	___/___	___/___	6. Process Valves	___/___	___/___	___/___
7. Piping to and from Steam Traps.	___/___	___/___	___/___	7. Piping to and from Steam Traps.	___/___	___/___	___/___

*Listed is only one line of a set of piping that have the same diameter and contain the same fluid at an identical temperature.

II. TURBINES AND ELECTRIC MOTORS

The design considered the following provisions when specifying the type of drive for the listed equipment.

Equipment Item	Pumps		Compressors		Agitators/ Mixers		Blowers		Fans	
a) High efficiency electric motors	P-1	___	___	___	___	___	___	___	___	___
b) Variable speed and/or variable horsepower motors or turbines in order to provice flexibility during operations at low rates.	NF	___	___	___	___	___	___	___	___	___
c) Design specifies optimal motor phase and voltage (normal is 3 phase, 440V motors)	✓	___	___	___	___	___	___	___	___	___
d) Space or coil heaters for motors are included only when necessary.	___	___	___	___	___	___	___	___	___	___
e) Steam or gas turbine (instead of an electric motor).	NF	___	___	___	___	___	___	___	___	___

Items to be considered when specifying a turbine

1. Compatibility with current and projected plant steam balance.
2. Use of exhaust gas or steam in other areas.

DESIGN NO: 202-100-584-SWS

III. ROTATING EQUIPMENT

The design considered the following provisions when specifying the listed equipment.

A. Pumps	Item No.		B. Compressors	Item No.	
	P-1				
1) Use of a pressure system as a viable alternative.	NF		1) Minimum/Maximum flow compatible with varying production rates.		
2) System pressure drop optimized by comparing cost of energy to the cost of the system (piping and equipment)	✓		2) Parallel but different sizes economically feasible to provice flexibility.		
3) A comparison of the turndown vs. minimum flow requirements.	✓		3) Efficiency at the normal flow rate=		
4) Efficiency at the normal flow rate =	84		4) Efficiency at the minimum expected rate =		
5) Efficiency at the minimum expected rate =	70		5) Comparison of single versus multi-stage.		

C. Mixers/Agitators	Item No.	
1) High efficiency blades and use of baffles for better mixing.		
2) Economic comparison of a larger size versus multiple mixers.		
3) Use of variable speed mixers		

IV. HEAT TRANSFER EQUIPMENT

The following provisions were considered in the design of heat transfer equipment.

A. General Considerations for All Types of Heat Transfer Equipment	Item No.			
1) Control instrumentation is included to prevent over-heating or over-cooling.				
2) Economics of an in-line spare if an onstream cleaning can not be performed.				
3) Calculating an accurate overall heat transfer coefficient. The HTRI design methods can be used in the calculation.				
4) Variation of the overall heat transfer coefficient versus turndown.				
5) A sufficient allowance for fouling.				
6) Using another process stream as a heating or cooling medium (interchanging).				

B. Reboilers and Steam Heaters	Item No.		C. Coolers and Condensers	Item No.	
1) Compatibility with steam balance			1) Economic comparison of a cooling water exchanger versus an air-cooled exchanger.		
2) Condensate returned to a header					
3) Allowances in the design for use of different pressure steam.			2) Provide the necessary connections to perform an onstream back wash of the cooling water side of the exchanger.		

D. Fired Heaters	Item No.		E. Interchangers	Item No.	
1) Insulating Refractory(Consult with MED)			1) Steam savings must be compatible with the plant's steam balance.		
2) Multi-fuel burners					
3) Preheat of combustion air					
4) Stack gas heat recovery					
5) Stack gas analyzer and/or excess oxygen controller					

CWH 000008870

DESIGN NO: 202-100-584-SWS

V. STEAM TRAPS

Refer to Conoco Engineering Standard A-15 for design specifications.

	Item No.			
1) Trap sized for proper flowrate and safety factor				
2) Condensate is to be returned to the return system when economically feasible.				
3) P&I notes for discharge piping into the top of the return header.				
4) A three way test valve is to be installed downstream of traps discharging to a return header.				

VI. MONITORING INSTRUMENTATION

The following items are necessary in order to monitor the energy usage of the designated item.

A. Heat Exchanger Number				B. Pump Number	P-1		
1) Shell and tube side inlet and outlet temperatures.				1) Suction and discharge pressure gauges.	✓		
2) Steam side pressure.				2) Outlet flow meter			
3) Steam flow meter.							
C. Compressor Number				D. Turbine Number			
1) Inlet pressure and temperature gauges for each stage.				1) Inlet pressure and temperature gauges.			
2) Discharge pressure and temperature gauges.				2) Outlet pressure and temperature gauges.			
3) Inlet flow meters for each stage							
4) Discharge flow meter.							
5) Recycle flow meter.							

VII. MAINTENANCE CONSIDERATIONS

A. Equipment Preparation for Maintenance Work

_____ Procedures are included for the most efficient method of emptying, clearing, purging, and/or regenerating process equipment included in the design.

B. Maintenance

_____ All preventive maintenance items that contribute toward maintaining the maximum efficiency of the process equipment are noted.

VIII. GENERAL

The following items should be considered for all designs.

A. Operating Procedures

_____ Normal operating procedures are included that note in detail those items which must be followed in order to achieve maximum energy efficiency.

_____ Supplemental operating procedures are included for maximum energy efficiency for operations at below normal rates or any other special conditions such as startups, shutdowns or abnormal operations.

B. Relief Valves

_____ Discharge of relief valves are returned to process or a collection vessel for product recovery.

C. Impact

YES Installation of the project impacts energy consumption of existing plant equipment.

NEGATIVE IMPACT.

DESIGN NO: 202-100-584-SWS

ENERGY IMPACT STATEMENT

The following is a procedure for calculating the energy savings or usage of the project on the CMA Basis.

A. Steam

1) The amount of steam that is saved (used) by the project and its pressure = 0 MM Lbs/Yr
= _____ psig

2) From the plant steam balance the equivalent 600 psig steam savings (usage) 0 MM Lbs/Yr.

3) CMA Energy factor for steam. x 1655 BTU/Lb.

4) Total CMA Energy for steam saved (used). 0 MM BTU/Yr.

B. Electricity

1) The electricity saved (used) by the project. 50 Hp, 7680 Hr./Yr. (.2863) MM KWH/Yr.

2) CMA Energy factor for electricity. x 10,000 BTU/KWH

3) Total CMA Energy for electricity saved (used). (2,863) MM BTU/Yr.

C. Natural Gas

1) The natural gas saved (used) by the project. 0 MM SCF/Yr.

2) CMA Energy factor for natural gas. x 1,040 BTU/SCF

3) Total CMA Energy for natural gas saved (used). 0 MM BTU/Yr.

D. Product Recovery and Loss

1) Additional VCM saved (lost) 0 MM Lbs/Yr.

2) Energy factor for VCM (obtain from energy coordinator) x _____ BTU/Lb. VCM

3) Energy saved (lost) due to VCM savings (losses). 0 MM BTU/Yr.

4) Additional EDC saved (lost). 0 MM Lbs/Yr.

5) Energy factor for EDC (obtain from energy coordinator). x _____ BTU/Lb. EDC

6) Energy saved (lost) due to EDC savings (losses). 0 MM BTU/Yr.

7) Additional HCl saved (lost). 0 MM Lbs./Yr.

8) Energy factor for HCl. 2681.1 BTU/Lb. HCl

9) Energy saved (lost) due to HCl savings (losses). 0

10) Total energy saved (lost) due to product recovery (loss). 0 MM BTU/Yr.

E. Summary

1) Total net savings (usage). Sum of lines A-4, B-3, C-3, and D-10. (2,863) MM BTU/Yr.

2) Equivalent 1972 CMA energy usage based upon production of 670MM Lbs. VCM/Yr, no incremental EDC and no HCl sales. + 3,434,621 MM BTU/Yr.

3) Fractional decrease (increase) in energy consumption on the CMA Basis. x 100%

4) Percent decrease (increase) in energy consumption on the CMA Basis. (.083) %

CWH 000008872

VCM PLANT

PROCESS DESIGN SAFETY CHECK LIST

DESIGN NO: 202-100-584-SWS

I. OVERPRESSURE PROTECTION

A. Overpressure Design Basis

Equipment was checked for conditions listed below. Overpressure protection designed for the condition indicated by a check.

Pressure Vessels	Item No.	
1. Blocked Valve		
2. Cooling Water Failure		
3. Instrument Failure		
4. External Fire		
5. Other (Specify)		
Protection by RV-No.		
Alternate Protection Noted Below		

Exchangers	Item No.	
1. Blocked Valve - Cold Fluid Vaporization		
2. Blocked Valve - Cold Fluid Expansion		
3. Tube Rupture		
4. External Fire		
Protection by RV-No. (Tube Side)		
Protection by RV-No. (Shell Side)		
Alternate Protection Noted Below		

Rotating Equipment	Item No.	
Blocked Discharge Valve		
Positive Disp. Pump		
Positive Disp. Compressor		
Steam Turbine		
Protection by RV-No.		

Piping	Line No.	
	18-WH-5	
Blocked in Line		
Vaporization		
Thermal Expansion		
Protection by RV-No.	PSV-112	

B. Relief Valves

Relief valves and inlet and outlet piping specifications were checked for the following conditions:

Relief Valve Number	PSV-112							
1. Liquid Flashing								
Effect on Valve Capacity	OK							
Design Temperature	OK							
2. Discharge Back Pressure								
3. Inlet Line Losses--Friction & Acceleration ΔP	OK							
--Notes Included for Max. Length	OK							
4. Inlet & Outlet Piping--Free Draining or Drain Valve Included								

II. VESSEL CLEARING

A. Clearing Connections

Clearing of equipment containing toxic or regulated vapors and liquids is provided for as follows:

	Vessels			Exchangers		Pumps			Others		
Equipment Item						P-1					
Contents						H2O					
Permanent Piping for:											
1. Liquids to Closed Process Sewer											
2. Vent to Direct Chlorination Header											
3. Vent to Wet Vent Header											
4. Vent to Relief Vent Header											
5. Return to Process											
Connections for Temporary Hoses											
Isolation Capabilities for Clearing											
Bleeders for Clearing/Draining/Purging						✓					

CWH 00000873

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B. Prevention of Backflow

Nitrogen connections for clearing equipment items and lines are protected against backflow as follows:

Equipment Item	Vessels			Exchangers		Pumps			Others		
						P-1					
1. Check Valve in Permanent N_2 Line						NA					
2. Hose Connection with Check Valve						NA					
3. System Pressure <40 psig, Hoses to be Disconnected After Purge											

III. MECHANICAL & MAINTENANCE CONSIDERATIONS

A. Plant Design Standards are more restrictive than company standards in several areas. Notes have been included as required in the following areas:

1. Gaskets

	Gasket Per Plant Standard	Piping Description	Applicable Piping Specifications
✓	Garlock 900 Round	CS, SS, Nickel, Monel Piping	A2-1, A2-7, A10-1, A13-4, A20-1, A21-1, B2-1, B2-12, B13-1, B13-3
	Flexitallic Spiral Wound	Steam & Condensate Service	A2-3, B2-6, D2-5
	TFE Envelope - Ring Gasket	Lined Piping	X25-2, X26-2, X27-1
	TFE Envelope - Full Face	FRP & Furan	R37-1, R37-3

2. Materials of Construction--Design notes have been included for:

✓ Electric driven equipment specifying no aluminum parts.
____ Dry chlorine piping (B2-12 Spec.) specifying CS valves with Hastelloy C trim.
____ Minimizing copper or copper alloys in possible contact with acetylene.

B. Rotating Equipment

The following pumps, compressors, blowers, and agitators have been checked for the following and the required specifications and notes have been included:

Equipment No.	P-1			
Minimum Flow Requirements	✓			
Shaft Seals--Type & Required Lubr./Flush	✓			

C. Tie-in Points to existing piping or equipment have been located, verified, and denoted if

✓ they are turnaround items.

D. Preventive Maintenance

OK Notes have been included on any new equipment that requires special PM to ensure safe operation.

CWH 00000874

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IV. PERSONNEL EXPOSURE & PROTECTION

A. Employee Exposure

_____ Design has been checked from a personnel exposure standpoint to ensure that during normal operations, clearing for maintenance, or maintenance activity employee exposure is within regulations.

B. Handling of Hazardous Materials

_____ Design includes provisions for safety equipment (fire extinguishers, deluge systems, safety shower and eyewash stations, fresh air systems, etc.) where required.

C. Personnel Protection Insulation has been specified for hot lines ($>150^0F$) where

_____ necessary.

D. Accessibility of Valves & Instruments

_____ Notes have been included to ensure that valves, instruments, motors, etc. are accessible from grade or platform to permit operation and maintenance.

E. Noise Limits

✓ Specifications of equipment have been checked or noted to ensure meeting noise limits as set by Standards H-7 (control valves) & X-5 (general).

F. Spill Containment & Control

_____ Design includes provisions where required for spill containment and control such as diked areas, piping to process sewers, etc.

G. Lighting for Night Operations has been checked for the proposed location and provisions for any required new

_____ lighting have been included.

H. Communications System

_____ Provisions for additional communications system lines have been included as necessary.

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V. PREVENTION OF POTENTIAL HAZARDS

A. Emergency Shutdown Requirements

Design specifications, considerations, and notes have been made as necessary for the following items:

✓ 1. Control valve failure position in event of air and/or electrical loss has been noted on spec. sheet and P&I.
OK 2. Spare equipment has been provided as needed and verified with Operations.
____ 3. Required alarms and their set points have been confirmed with Operations.
____ 4. Consideration has been given to make the system failsafe, including automatic shutdown sequences and system interlocks where feasible.

B. Fire Prevention and Protection

The following items have been checked and specifications or notes included as required:

____ 1. System flammability (both process streams and materials of construction) under normal and upset conditions.
____ 2. Provision for inert or nonflammable atmosphere such as nitrogen blanketing or purging.
____ 3. Need for flame arrestors to prevent flashbacks.
____ 4. Need for additional fire protection systems such as sprinklers, types of extinguishers, etc.

C. Electrical Grounding/Bonding of vessels, pumps, and piping has been included as required to dissipate

____ build-up of static charge.

D. Locked or Chained Valves

____ Notes have been included on the P&I for valves that must be locked or chained opened or closed for safety reasons.

E. Chemistry of Mixing Streams has been checked to ensure that chemical reactions will not create a potentially

____ hazardous situation.

F. Minimum Clearances of new equipment from existing equipment and structures have been checked with Standard X-3

____ and design notes included where required.

Legend

✓ Item verified as stated and specified action taken.
OK Item verified but no action required.
NA Item not applicable.
____ No action taken.

REV.1 - 3/81

CWH 000008876

WORK LIST

Refer to Drawing No. VCM-202-1.

1) Pour a foundation for H-101 Cooling Water Circulation Pump P-1 in the area just northwest of Direct Chlorination Reactor R-101. See Drawing No. VCM-202-3.

2) Install H-101 Cooling Water Circulation Pump P-1 on the new foundation.

3) Install an 18" globe valve in the H-101 cooling water return line (18"-WH-5-N-A2-1) downstream of the existing 18" globe valve in line 18"-WH-5. Locate the new 18" valve in an accessible location west of R-101.

4) Run line 10"-WH-1-N-A2-1 from the H-101 cooling water return line (18"-WH-5-N-A2-1) downstream of the existing 18" globe valve and upstream of the new 18" globe valve to the suction of P-1. Install a 10" gate valve, a 2" bleed valve, and a pressure gauge on line 10"-WH-1.

5) Run line 8"-WH-2-N-A2-1 from the discharge of P-1 to the H-101 cooling water return line downstream of the new 18" globe valve on line 18"-WH-5. Install H-101 Cooling Water Temperature control valve TCV-1 in line 8"-WH-2. Install two 8" gate valves, an 8" check valve, two 2" bleed valves, and a pressure gauge in line 8"-WH-2.

6) Run line 8"-WH-3-N-A2-1 from line 8"-WH-2-N-A2-1 downstream of the 8" gate valve and upstream of TCV-1. Install an 8" gate valve in line 8"-WH-3.

7) Install R-101 Temperature Controller TIC-1 (Provox) in the rack room. TIC-1 will be located in cabinet I-1, DC #1 (Device 6), File #3, and Slot #7. Jumper the voltage inputs from Temperature Transmitter TT-104-1 (Mux #1 (Device 21), File #2, Slot #5, Terminals 5 and 6) to analog input #1 of TIC-1 (Terminals 1 and 2). Refer to Drawing No. VCM-202-2. Configure TIC-1 and download the configuration.

TIE-IN LIST

Refer to Drawing No. VCM-202-1.

All tie-ins below require a cooling water system shutdown and are, therefore, turnaround items.

1) Tie-in line 10"-WH-1-N-A2-1 to the H-101 cooling water return line (18"-WH-5-N-A2-1) downstream of the 18" globe valve and upstream of the new 18" globe valve.

2) Tie-in line 8"-WH-2-N-A2-1 to the H-101 cooling water return line (18"-WH-5-N-A2-1) downstream of the new 18" globe valve.

3) Tie-in line 8"-WH-3-N-A2-1 to the H-101 cooling water supply line (18"-WC-4-N-A2-1) upstream of the 18" butterfly valve.

conoco

Engineering Center
Ponca City, Oklahoma

Control Valves

SPECIFICATION DATA SHEET
PROJECT NO. 202-100-S84-SWS
A.F.E. NO. _____
REQ. NO. _____
DATE 5/10/84 APP'D BY _____
MADE BY SWS

PLANT VCM PLANT PROJECT R-101 TEMPERATURE CONTROL

GENERAL	1	TAG NO.			TCV-1						
	2	SERVICE			H-101 CW TEMP. CONTROL						
	3	MODEL NO.			7600 CLASS 2 FISHTAIL						
	4	LINE NO.			8"-WH-1-N-AZ-1						
	5	LINE SIZE/SCHED. NO.			8" SCH.40						
PROCESS DATA AND SIZING	6	FLUID			COOLING WATER						
	7	TEMP. NORMAL	MAX.		85	110					
	8	PRESS. NORMAL	MAX.		50	85					
	9	ΔP MIN. RATE	NOR. RATE	MAX. RATE	3	5	5				
	10	MAX. SHUTOFF ΔP			75						
	11	RATE MIN. GPM	CV		0	—					
	12	RATE NOR. GPM	CV		250	116					
	13	RATE MAX. GPM	CV		3750	1674					
	14	VALVE CV MAX.	ΔP (ALLOW)		2440	37					
	15	SP. GR. @ 60°F	MOL. WT.		.9963	18					
	16	OPER. VISC. Cp	% FLASH		.8180						
	17	% SUPERHEAT	% SOLID								
	18	VAPOR PRESS. @ F.T. mmHg	CRIT. PRESS. PSIA		30.7						
	19	WEIGHT % VAPOR IN	OUT		0	0					
	20	PRED. SND. LEV.(1)	RATE								
	21	MAX. ALLOW. SND.(1)	RATE		85dB						
	22										
BODY	23	MFR	MODEL		FISHER	7600					
	24	TYPE OF BODY			CLASS 2 FISHTAIL DISK						
	25	BODY SIZE	GUIDING		8"						
	26	PORT SIZE	NO. OF PORTS		FULL	1					
	27	END CONN & ANSI CLASS			300# R.F.						
	28	BODY MATERIAL			C.S.						
	29	PACKING MATERIAL			TFE						
	30	BONNET TYPE			STD.						
	31	TRIM FORM			EQ. PERCENT						
	32	CV FULL OPEN			2440						
	33	LUBRICATOR	ISO. VAL.		NO	NO					
	34	TRAVEL INDICATOR			YES						
	35	% VALVE OPENING AT MIN./MAX. CV			10°/90°						
	36	TRIM MATERIAL SEAT/[redacted] BUTTERFLY			C.S.						
	37	STEM/SHAFT MTL.			C.S.						
	38	REQUIRED SEAT TIGHTNESS(2)			ANSI CLASS 3						
	39	ROTATION AT MAX. FLOW			75°						
ACTUATOR	40	MFR	MODEL		FISHER						
	41	TYPE	SIZE		DIAPHRAGM						
	42	CLOSE AT	OPEN AT		15 PSIG	3 PSIG					
	43	FLOW ACTION TO OPEN/CLOSE			AIR TO CLOSE						
	44	FAIL POSITION			OPEN						
	45	HANDWHEEL (SIDE/TOP)			NONE						
POSITIONER	46	MFR.	MODEL NO.								
	47	INPUT SIGNAL	OUTPUT SIGNAL		3-15 PSIG	3-100 PSIG					
	48	AIR SUPPLY PRESS. MAX.									
	49	FILTER REGULATOR			NO						
	50	GAGES	BYPASS		YES	YES					
	51										
OPTIONS	52										
	53										
	54										
	55										
NOTES	56	1. SOUND LEVEL IN DBA MEASURED 3 FT. FROM CONNECTED PIPING.									
	57	2. ANSI B16.104 (CURRENT ISSUED) LEAKAGE SPECIFICATIONS.									
	58										

CWH 000008879

QUOTATION WILL NOT BE CONSIDERED IF MANUFACTURER DOES NOT COMPLETE FORM BY FURNISHING INFORMATION FOR BLANK SPACES.

SPEC NO. _____ REV. 0
SHEET 1 OF 9

4-435-S
4-82

CONOCO

Engineering Center
Ponca City, Oklahoma

Indicators, Recorders, Controllers (Receiver Instruments)

SPECIFICATION DATA SHEET
PROJECT NO. 202-100-584-SWS
A.F.E. NO. _____
REQ. NO. _____
DATE 5/14/84 APP'D BY _____
MADE BY SWS

PLANT VCM PLANT PROJECT R-101 TEMPERATURE CONTROL

GENERAL	1	ITEM NO.	TIC-1		
	2	SERVICE	R-101 TOP TEMP.		
	3		CONTROL		
	4	MANUFACTURER	FISHER OR EQUIV.		
	5	MODEL NO.	CL7001X1-A1		
DESIGN DETAILS	6	INSTRUMENT FUNCTION	TEMP. CONTROL		
	7	INSTRUMENT MOUNTING	PROVOX (1)		
	8	ELECTRICAL CLASSIFICATION			
	9	POWER SUPPLY			
	10	INPUT SIGNAL	4-20ma (2)		
	11	ACCURACY			
	12	REPEATABILITY			
	13				
	14				
	15				
INDICATOR-RECORDER	16	NO. OF PENS OR POINTERS	1		
	17	SCALE RANGE	0-300 °C		
	18	CHART SIZE AND TYPE			
	19	CHART RANGE			
	20	CHART NUMBER			
	21	CHART FACTOR			
	22	CHART DRIVE			
	23				
	24				
CONTROLLER	25	CONTROL MODE (SEE LINE 44)	PI/PID/I		
	26	CONTROLLER ACTION	REVERSE		
	27	SCALE RANGE	0-300 °C		
	28	SET POINT ADJ.: MAN.—REMOTE	MANUAL		
	29	AUTO—MAN. SWITCH AND ADJ.	MFG. STD.		
	30	OUTPUT SIGNAL	4-20ma		
	31				
	32				
ALARMS	33	ALARM FUNCTION	DEVIATION		
	34	QUANTITY AND FORM	% OF RANGE		
	35	CONTACT RATING			
	36				
	37				
ACCESSORIES	38				
	39				
	40				
	41				
	42				
	43				

NOTES

44 | CONTROL MODES: P = PROPORTIONAL (GAIN), I = INTEGRAL (RESET), D = DERIVATIVE (RATE), BIAS, GAP, RATIO, BATCH
45 | RECORDER INK SUPPLY: CAPILLARY WITH 6 MONTHS MIN. SUPPLY.
46 | (1) PROVOX CONTROLLER. LOCATION IN RACK ROOM TO BE DETERMINED
47 | BY INSTRUMENT & ELECTRICAL SUPERVISOR.
48 | (2) SIGNAL TO BE SUPPLIED FROM TT-104-1 (EXISTING).
49 |
50 | CWH 000008880
51 |
52 |

QUOTATION WILL NOT BE CONSIDERED IF MANUFACTURER DOES NOT COMPLETE FORM BY FURNISHING INFORMATION FOR BLANK SPACES.

SPEC NO. _____ REV. 0
SHEET 2 OF 9

4-439-S

7-82

PROVOX CONFIGURABLE CONTROLLER CONFIGURATION

FISHER Controls

CL WORKSHEET# 3 of 9

DOCUMENT NUMBER

DATE 5/14/84

ENGINEER SWS

CUSTOMER	R-101 TEMPERATURE CONTROL
PLANT	VCM PLANT
P.O. NUMBER	DESIGN No. 202-100-584-SWS

REVISIONS

DATE	ENG.	COMMENTS

CONTROLLER SPECIFICATION

MODEL NO: CL 7 0 0 1 -A 1 -B -C -D

CONTROLLER SPEC SHEET NO.

OPERATOR STATION SPEC SHEET NO.

PROCESS DESCRIPTION

CWH 000006881

POINT TAG NAME T I C - 1 ENGINEERING UNITS (EU) D E G C

CONTROL IMPLEMENTATION CHECK-OUT STATUS

FUNCTION	DATE	ENG.	COMMENTS	FUNCTION	DATE	ENG.	COMMENTS
DOCUMENTATION				REVISION			☐ CONFIG ☐ TUNE
DATA ENTRY			☐ TUNER ☐ CONSOLE	DATA CHECK			☐ OK
STORAGE			CARD ID NO. DISKETTE NO.	DOWNLOAD			☐ TUNER ☐ CONSOLE

TUNER CONFIGURED

CONFIGURATION PARAMETERS

STEP#	PARAMETER	CR?	VALUE	VALID RANGE	
1	PCA/ST			1	12
2	FF ENB?			NO	YES
3	FF FIL?	2Y		NO	YES
4	FF SORT?	2Y		NO	YES
5	PV FIL?			NO	YES
6	PV SORT?			NO	YES
7	SPT MAN?			NO	YES
8	SPT DDC?			NO	YES
9	VOT ENB?			NO	YES
10	VOT MAN?	9Y		NO	YES
11	OVERIDE?			NO	YES
12	ALM BHI?			NO	YES
13	ALM CHI?			NO	YES
14	DO ALMB?			NO	YES
15	WTCHDOG?			NO	YES
16	TR RAMP?			NO	YES
17	MV1 SIG?			NO	YES
18	MV2 SIG?			NO	YES
19	MV3 SIG?			NO	YES
20	MV4 SIG?			NO	YES
21	HI SEL?			NO	YES
22	RST LSP?			NO	YES
23	RST LMD?			NO	YES
24	RST LVO?			NO	YES
25	RST LBI?			NO	YES
26	TK SQRT?	9Y		NO	YES
27	TK FIL?	9Y		NO	YES

TUNING PARAMETERS

STEP#	PARAMETER	CR?	VALUE	VALID RANGE	
1	EU 0% (EU)			-99999	99999
2	EU 100% (EU)			-99999	99999
3	GAIN (k)			0	128
4	RESET (R/M)			0	293
5	RATE (min)			0	895
6	RAMP TIM (min)	16Y		0	56
7	PV FTIM (min)	5Y		0	1.8
8	REV ACT?			NO	YES
9	INC CLO?			NO	YES
10	ALM A (EU)			0	136
11	ALM B (EU)			-16	136
12	ALM C (EU)			-16	136
13	ALM DBND (EU)			0	136
14	SP LO Limit (EU)			-13.97	113.97
15	SP HI Limit (EU)			-13.97	113.97
16	VO LO Limit (%)			-13.97	113.97
17	VO HI Limit (%)			-13.97	113.97
18	ARW LO Limit (%)			-13.97	113.97
19	ARW HI Limit (%)			-13.97	113.97
20	FF GAIN (k)	2Y		0	1
21	FF REV?	2Y		NO	YES
22	FFFTIM (min)	3Y		0	112
23	TKFTIM (min)	27Y		0	112
24	WTCHDOG TIMER (min)	15Y		0	56
25	BACKUP MODE (Code)	15Y		1	2
26	RESTART MODE (Code)	23N		1	5
27	RESTART VO (%)	24N		-13.97	113.97
30	RESTART SP (EU)	22N		-13.97	113.97
31	RESTART BIAS (%)	25N		-13.97	113.97

PCA/STATION TYPE ENTRY CODES

STATION	1	MANUAL							
	2	AUTO/MAN							
	3	AUTO/MAN/RSP							
	4	AUTO/MAN/SUP							
	5	AUTO/MAN/DDC							
	6	MAN/DDC							
PCA	1	MANUAL LOADER	11					10	
	2	BIAS & GAIN					9		
	3	SIGNAL SELECT					12		
	4	PD/P		8	7	6	5		
	5	PI/PID/I		4	3	2	1		
	CONSOLE-ENTERED CODE		TUNER-ENTERED CODE						

MODE ENTRY CODES (TUNER ENTERED)

STATION MODE	CODE
MANUAL	1
AUTO	2
REMOTE SET POINT (RSP)	3
SUPERVISORY (SUP)	4
DIRECT DIGITAL CONTROL (DDC)	5

CONSOLE CONFIGURED*

*SUBJECT TO APPROVAL OF I&E SUPV.

HWY NO. 2 (1 through 8) Reference Only

CIA NO. 06 (1 through 30)

DEVICE TYPE DATA CONC.

DEVICE NAME DC#1

DATA CONC. PORT NO: 15 (1 through 16)

POINT TAG NO. TIC-1

PCA DEFINITION

PCA TYPE PI/PID/I | PCA NO. 5

POINT DESCRIPTOR R-101 TEMP. CONTROL

POINT ADDRESS (Reference Only) 02 - - - 01

ENG. UNIT (EU) DESCRIPTOR DEG C

PCA DEFINITION CONT.

QLD NO.	SELECTION	COMMENTS
1	300	E.U. 100%
2	0	E.U. 0%
3	75	SP. HIGH LIMIT
4	40	SP LOW LIMIT
5	REV	DIR/REV. ACTION
6	NO	S.P. TRACKS IN MAN?
7	—	RESTART LAST SP?
8	—	RESTART SP
9	105	ARW LIMIT HIGH
10	-5	ARW LIMIT LO
11	4.0	GAIN
12	1.0	RESET
13	0.5	RATE
14		
15		

STATION DEFINITION

STATION TYPE | TYPE NO.

QLD NO.	SELECTION	COMMENTS
1	105	INP HIGH LIMIT
2	-5	INP LOW LIMIT
3	2	DEV. ALARM TRIP
4	LOW	ALARM B
5	0	ALARM B TRIP
6	HIGH	ALARM C
7	300	ALARM C TRIP
8	2	ALARM DEADBAND
9	NO	ALM B TO DO 1?
10	CLOSE	INCREASE OPEN/CLOSE
11	NO	RESTART LAST MODE?
12	MAN	RESTART MODE
13	NO	RESTART LAST INP?
14	100	RESTART INP.
15		
16		
17		
18		
19		
20		

PSEUDO FST DEFINITION

QLD NO.	SELECTION	COMMENTS
1	NO	FF ENABLE?
2	NO	FF INPUT FILTER?
3	—	FF INP. FILTER TIME.
4	NO	FF INPUT SQR. ENABLE?
5	—	FF DIR/REV ACTING
6	—	FF GAIN
7	YES	PV INPUT FILTER?
8	0.015	INPUT FILTER TIME
9	NO	PV INPUT SQR. EN?
10	NO	OUTPUT TRACKING?
11	NO	OUTPUT TRACK OVERRIDE?
12	NO	OVERIDE ENABLE?
13	NO	TRACK INPUT FILTER?
14	—	TRACK FILTER TIME
15	NO	TRACK INPUT SQR.?
16		
17		

CWH 000008882

CONOCO

Engineering Center
Ponca City, Oklahoma

Centrifugal Pumps

SPECIFICATION DATA SHEET
PROJECT NO. 202-100-584-SWS
A.F.E. No.
REQ. NO.
DATE 5/10/84 APP'D BY
MADE BY SWS

PLANT VCM PLANT PROJECT R-101 TEMPERATURE CONTROL

GENERAL

1	APPLICABLE TO: ☒ ESTIMATE E-1 ○ PURCHASE	○ AS BUILT ○ ITEM NO.
2	☒ SERVICE H-101 COOLING H2O CIRCULATION	☒ MANUFACTURER DURCO OR EQUIV. *
3	☒ LOCATION BLOCK I, NEAR R-101	☒ NO. REQUIRED 1
4	☒ MOTOR DRIVE 50 HP, 880 RPM *	○ TURBINE
5	PUMP IS TO BE MANUFACTURED IN ACCORDANCE WITH THE FOLLOWING STDS.:	○ API 610 ☒ ANSI B73.1 ○ ANSI B73.2
6	PUMP SIZE 10x8-16H * TYPE MARK II STD. *	NO. STAGES 1
7	NOTE: ○ INDICATES INFORMATION TO BE COMPLETED BY PURCHASER ☐ BY MANUFACTURER	

OPERATING CONDITIONS

8	☒ LIQUID WATER	○ NPSH AVAILABLE (ft) 13.9
9	☒ PUMPING TEMPERATURE (°F): NORM. 85 MAX. 110	○ CAPACITY @ PT (US gpm): NORM. 3500 RATED 3750
10	☒ SPECIFIC GRAVITY @ PT 0.9963	○ DISCHARGE PRESSURE (psig) MAX 104 RATED 75
11	☒ VAPOR PRESSURE @ PT ~~(psia)~~ 30.7 mm Hg	○ SUCTION PRESSURE (psig): MAX. 85 RATED 56
12	☒ VISCOSITY @ PT: ~~SSU~~ 0.8180 cp	This sounds kind of h
13		○ DIFFERENTIAL PRESSURE (psi) (19) AT DESIGN CAPACITY
14	☒ SITE AMBIENT TEMPERATURE (°F): MAX. 105 MIN. 85	○ DIFFERENTIAL HEAD (ft) 44.4 AT DESIGN CAPACITY
15		○ HYDRAULIC hp 41.6
16	○ UNUSUAL CONDITIONS	LOCATION: ○ INDOOR ○ HEATED ○ WITH ROOF for SPare
17		☒ OUTDOOR ☒ UNHEATED ☒ WITHOUT ROOF H-101 on CW side.
18	○ CORROSION/EROSION CAUSED BY	
19		
20	REMARKS:	
21		
22		

PERFORMANCE

23	☒ PROPOSAL CURVE NO. MII 8429V *	☐ MINIMUM CONTINUOUS FLOW (US gpm):
24	☒ SPEED (rpm) 880 *	THERMAL STABLE
25	☒ NPSH REQUIRED (WATER) (ft) 7.5 *	☐ ROTATION (VIEWED FROM COUPLING END) ☐ CW ☐ CCW
26	☒ RATED bhp 50 *	☐ SUCTION SPECIFIC SPEED
27	☒ MAXIMUM bhp WITH RATED IMPELLER 52 *	☒ EFFICIENCY (%) (AT NORMAL CAP. AND RATED SUCT. PRESS.) 83 *
28	☒ MAXIMUM HEAD WITH RATED IMPELLER (ft) 67 *	
29	REMARKS:	
30		
31	*DO NOT TRANSMIT TO VENDOR	

CONSTRUCTION

32	CASING MOUNT:			NOZZLES	SIZE	RATING	FACING	LOCATION
33	☒ CENTERLINE	○ NEAR CENTERLINE	○ FOOT	SUCTION	☒ 10	☒ 150#	☒ RF	☐
34	○ VERTICAL	○ IN LINE	○ BRACKET	DISCHARGE	☒ 8	☒ 150#	☒ RF	☐
35	○ VERTICAL BARREL	○ SUMP PUMP	○ OTHER					
36	CASING SPLIT:	☐ AXIAL	☐ RADIAL	BEARINGS (TYPE/NO.):				
37	CASING TYPE:	☐ VOLUTE	☐ SINGLE ☐ STAGGERED	☐ RADIAL		☐ THRUST		
38		☐ DIFFUSER	☐ DOUBLE	LUBRICATION TYPE:	☐ RING OIL	☐ OIL MIST	☐ PRESSURE	
39	☐ MAXIMUM ALLOWABLE PRESSURE:		psig @ 60 F		☐ FLOOD	☐ FLINGER		
40			psig @ PT	COUPLING:				
41	☐ HYDROSTATIC TEST PRESSURE:		psig	☐ MANUFACTURER				
42	IMPELLER DIAMETER (in.):			☐ TYPE				
43	☒ RATED 16"	☒ MAXIMUM 16"	☒ MINIMUM 13"	☐ MODEL				
44	IMPELLER MOUNT:	☐ BETWEEN BEARINGS	☐ OVERHUNG	DRIVER HALF-COUPLING MANUFACTURED BY:				
45	PACKING:			☒ PUMP MANUFACTURER	○ DRIVER MANUFACTURER	○ PURCHASER		
46	☐ MANUFACTURER			GLAND PLATE TAPS REQUIRED:				
47	☐ TYPE			○ QUENCH	○ FLUSH	○ DRAIN	○ VENT	
48	☐ SIZE/NO. OF RINGS			REMARKS:				
49	MECHANICAL SEAL:							
50	☒ MFR. CRANE OR EQUIV.							
51	☒ MODEL SINGLE			☐ WEIGHT OF PUMP AND BASEPLATE (lbs)				
52	☐ MFR. CODE			☐ WEIGHT OF MOTOR (lbs)				
53	☐ API CLASS CODE			☐ WEIGHT OF TURBINE (lbs)				
54	☐ GLAND TYPE/MATERIAL							
55	REMARKS:							
56								

CWH 000008883

QUOTATION WILL NOT BE CONSIDERED IF MANUFACTURER DOES NOT COMPLETE FORM BY FURNISHING INFORMATION FOR BLANK SPACES

SPEC NO. ____ REV. 0
SHEET 5 OF 9

4-424-S1

6-82

conoco

Engineering Center
Ponca City, Oklahoma

Centrifugal Pumps

SPECIFICATION DATA SHEET
PROJECT NO. 202-100-524-SWS
A.F.E. No.
REQ. NO.
DATE 5/10/84 APP'D BY
MADE BY SWS

PLANT VCM PLANT PROJECT R-101 TEMPERATURE CONTROL

AUXILIARY PIPING

1	○ SEAL FLUSH PIPING PLAN	MAT'L	○ COOLING-WATER PIPING PLAN	MAT'L
2	○ AUXILIARY FLUSH PLAN	MAT'L	☐ TOTAL COOLING WATER REQUIRED (US gpm)	
3	SEAL FLUSH PIPING: ○ THREADED ○ SOCKET WELDED ○ FLANGED		○ SIGHT FLOW INDICATORS REQUIRED	
4	○ EXTERNAL SEAL FLUSH FLUID REQUIRED		○ PACKING COOLING INJECTION REQUIRED	
5	☐ US gpm	☐ psig	☐ US gpm	☐ psig
6	REMARKS:			
7				
8				

MATERIALS

9	○ TABLE E-1 CLASS (PER API 610)	☒ SHAFT/SLEEVE S.S.
10	☒ BARREL/CASE C.S.	☐ BASEPLATE (MATERIAL/TYPE)
11	☒ INNER CASE PARTS C.S.	☐ API STANDARD 610 STANDARD BASEPLATE NO.
12	☒ IMPELLER S.S.	☐ ANSI B73.1 STANDARD BASEPLATE NO.
13	☒ CASE/IMPELLER WEAR RINGS S.S.	
14	REMARKS:	
15		

INSPECTION AND TESTS

16	TEST	NONWITNESSED	WITNESSED	OBSERVED	○ INSPECTION REQUIRED FOR NOZZLE WELDS:	
17	PERFORMANCE	○	○	○	○ MAGNETIC PARTICLE	○ DYE PENETRANT
18	HYDROSTATIC	○	○	○	○ INSPECTION REQUIRED FOR CASTINGS:	
19	NPSH	○	○	○	○ RADIOGRAPHIC	○ ULTRASONIC
20	○ SHOP INSPECTION	○ MATERIAL CERTIFICATION			○ INSPECTION REQUIRED FOR	
21	○ DISMANTLE AND INSPECT AFTER TEST				○ MAGNETIC PARTICLE	○ DYE PENENETRANT
22	○ CASTING REPAIR PROCEDURE APPROVAL				○ RADIOGRAPHIC	○ ULTRASONIC
23	REMARKS:					
24						
25						

DRIVER DATA

26	○ MOTOR DRIVER BY				○ TURBINE DRIVER BY			
27	○ ITEM NO.	○ MTD BY			○ ITEM NO.		○ MTD BY	
28	☒ HP 50	☒ RPM 880	☐ FRAME		☐ HP	RPM	☐ MAT'L	
29	○ MFR				○ TYPE			
30	OR COMPANY APPV'D. EQUAL				○ INLET STEAM, psig		○ TEMP °F.	
31	○ TYPE	○ INSUL.			○ EXHAUST, psig			
32	☒ ENC TEFC	○ TEMP RISE °C.			STEAM RATE, FL		lb/BHP/HR	
33	☒ VOLTS/PHASE/HERTZ 460/3/60				BEARINGS		LUBE	
34	☐ BEARINGS	☐ LUBE			NOZZLES	SIZE	ANSI RATING	FACING	POSITION
35	☐ FULL LOAD AMPS				INLET				
36					EXHAUST				
37	REMARKS: HIGH EFFICIENCY MOTOR REQUIRED								
38	WITH NOVALUMINUM PARTS.								

VERTICAL PUMPS

39	○ PIT OR SUMP DEPTH (in.) exposed (most all have				FLOAT AND ROD			
40	MINIMUM SUBMERGENCE REQUIRED (in.) Al parts - epoxy coated)				○ CARBON STEEL	○ STAINLESS STEEL	○ BRONZE	○ NONE
41	COLUMN PIPE	☐ FLANGED	☐ THREADED		☐ FLOAT SWITCH			
42	LINE SHAFT	☐ OPEN	☐ ENCLOSED		PUMP THRUST (lbs):			
43	GUIDE BUSHINGS				☐ AT MINIMUM FLOW		☐ AT DESIGN FLOW	
44	☐ BOWL	☐ LINE SHAFT			AT RUNOUT: ☐ UP		☐ DOWN	
45	GUIDE BUSHING LUBE	☐ WATER	☐ OIL	☐ GREASE				
46	REMARKS:							
47								

COST DATA

48	☐ DELIVERY, WEEKS
49	☐ PUMP PRICE
50	☐ DRIVER PRICE
51	☐ EST. FREIGHT
52	☐ TOTAL PRICE

NOTES

53	THE SOUND LEVELS GENERATED BY THE PUMP AND DRIVER SHALL BE WITHIN THE LIMITS OF THE ATTACHED SPECIFICATION.
54	
55	CWH 000008884
56	

QUOTATION WILL NOT BE CONSIDERED IF MANUFACTURER DOES NOT COMPLETE FORM BY FURNISHING INFORMATION FOR BLANK SPACES

SPEC NO. _____ REV. 0
SHEET 6 OF 9

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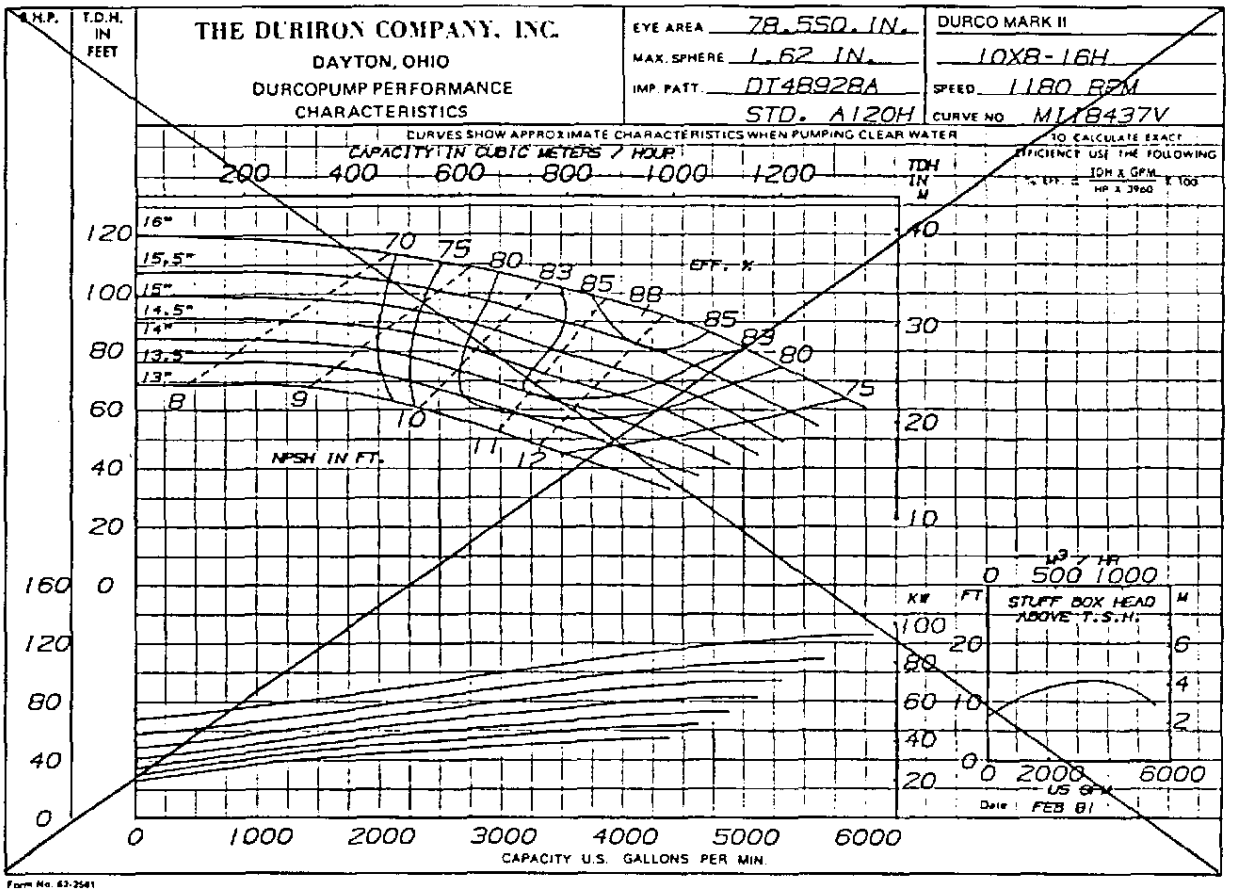
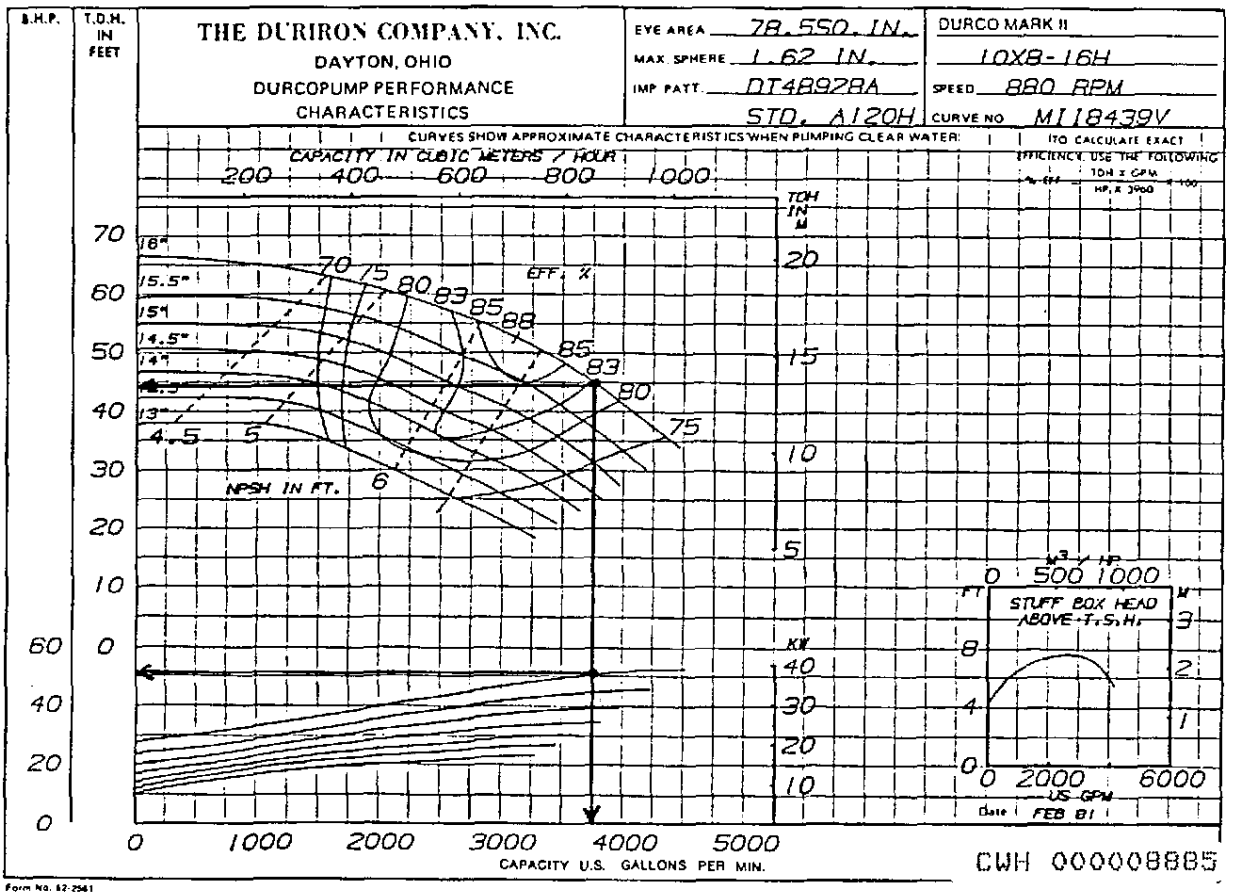
6-82





CWH 000008885

CONOCO

Engineering Center
Ponca City, Oklahoma

Pressure Gages

SPECIFICATION SHEET
PROJECT NO. 202-100-584-SWS
A F E. NO. _____
REQ. NO. _____
DATE 5/14/84 APP'D BY _____
MADE BY SWS

PLANT VCM PLANT PROJECT R-101 TEMPERATURE CONTROL

	TAG			RANGE (PSIG)		OPER.	TEMPERATURE				
	NO.	REV.	QUANT.	TUBE	DIAL	PRESS.	NORM.	MAX.	SERVICE	~~ACCESSORIES~~	NOTES
3	PG-1	0	1	0-150	0-150	75	85	110	COOLING WATER	LINE 10"-WH-1	
4	PG-2	0	1	0-150	0-150	75	85	110	COOLING WATER	LINE 8"-WH-2	

NOTES:

CWH 000008886

QUOTATION WILL NOT BE CONSIDERED IF MANUFACTURER DOES NOT COMPLETE FORM BY FURNISHING INFORMATION FOR BLANK SPACES

SPEC NO _____ REV. 0
SHEET 8 OF 9

4-447-S
4-81

SHEET 9 OF 9

CONOCO Engineering Center
Ponca City, Oklahoma

Specification Sheet

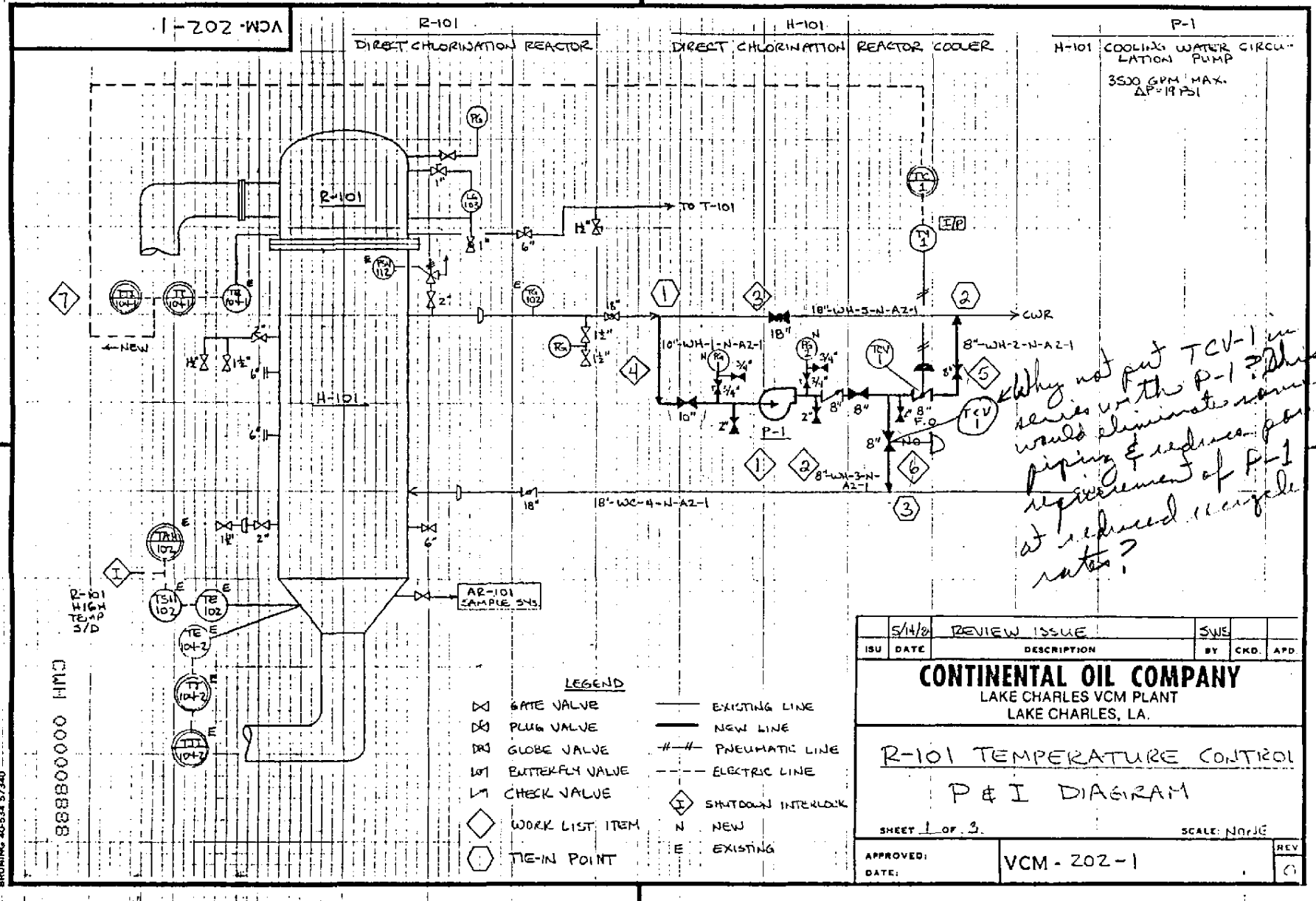
SPECIFICATION SHEET
PROJECT NO. 202-100-584-SWS
A.F.E. NO. _____
REQ. NO. _____
DATE 5/14/84 APP'D BY _____
MADE BY SWS

PROCESS PIPING SCHEDULE

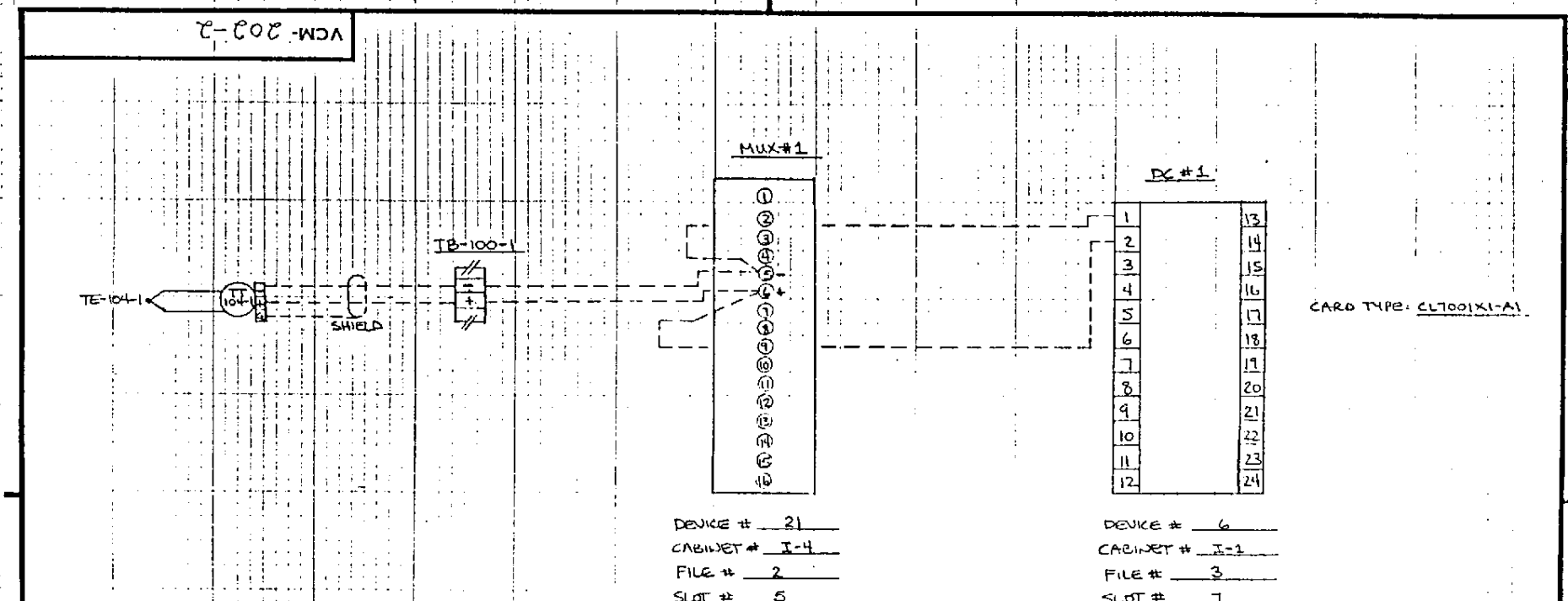
PLANT VCM PLANT PROJECT R-101 TEMPERATURE CONTROL

Line Designation	Service From	Service To	V L	Flow Rate GPM ~~Lb/Hr~~ (~~Hot BPSD~~)	Normal °F	Normal PSIG	At T and P LB/CF (SP GR)	At T and P Visc CP	Press Drop PSIG/100'	Vel ft/sec	Fluid
10"-WH-1-N-A2-1	H-101 CWR	P-1	L	3500	85	56	62.1	.818	2.33	14.298	COOLING WATER
8"-WH-2-N-A2-1	P-1	H-101 CWR	L	3500	85	75	62.1	.818	7.19	22.341	COOLING WATER
8"-WH-3-N-A2-1	LINE 8"-WH-2	H-101 CWS	L	3500	85	75	62.1	.818	7.19	22.341	COOLING WATER
NOTE: ALL GASKETS TO BE GARLOCK 900 ROUND FOR A2-1 SPEC. PIPING.											

CWH 00008887



Why not put TCV-1 in series with the P-1 ? This would eliminate some piping & reduce pump requirement of P-1 at reduced recycle rate?


VCM-202-2
MUX #1
DC #1
JB-100-1
TE-104-1
SHIELD
CARD TYPE: CL7001X1-A1
DEVICE # 21
CABINET # I-4
FILE # 2
SLOT # 5
DEVICE # 6
CABINET # I-1
FILE # 3
SLOT # 7
1 6/15/81 REVIEW ISSUE SWS
ISU DATE DESCRIPTION BY CKD. APD
CONTINENTAL OIL COMPANY
LAKE CHARLES VCM PLANT
LAKE CHARLES, LA.
TIC-1 LOOP DRAWING
SHEET 2 OF 3
SCALE: NONE
APPROVED:
DATE:
VCM - 202 - 2
REV
68880000 HMD
BRUNING 40-534 57340