Pacific Gas and Electric Company
California Gas Transmission

Recommended Practice

Number: RP 4332
Revision: 1

Issuing Department: GAS SYSTEM TECHNICAL SUPPORT
Manager: [redacted]

Effective Date: 1 May 1998
Review Date: 1 May 2000

SUBJECT: Removal and Control of Liquids from Gas Pipelines Maintenance and Operation of Associated Gas Conditioning Equipment

Objective

To establish the overall requirements and responsibilities for the removal and control of liquids from gas pipelines and the operation and maintenance of associated gas conditioning equipment.

Scope

This California Gas Transmission (CGT) Recommended Practice covers the requirements and responsibilities for the inspection, operation, maintenance and record keeping of facilities that remove and control liquids and associated gas conditioning equipment. Gas conditioning equipment include gas-liquid separators, and dehydration and corrosion inhibitor injection units.

Rescission

This Recommended Practice replaces Gas Supply Interim Standard IS 462-1, "Removal and Control of Liquids, Pipelines and Mains," dated 3/1/70.

Related Policy

Gas Tariff Rule 21

Originator

CGT Standards Technical Committee 33 on Gas Quality and Processing

Business Risk

Inadequate inspections, operation and maintenance of gas conditioning equipment and facilities that remove and control liquids can jeopardize the safe and reliable operation of the transmission and distribution pipeline systems. Inadequate removal and control of liquids in any gas pipeline system can contribute to increased internal corrosion and the formation of hydrates. Furthermore, delivery of gas with free liquids can cause customer utilization problems.

Exhibits, Appendices And Supplements

Appendix A:	Glossary and Definition of Terms
Exhibit 1:	Pipeline Patrol and Work Report
Exhibit 2:	Gas Dehydration Plant Inspection Report (Triethylene Glycol Type)
Exhibit 3:	Gas Dehydration Facility Inspection Report (Dry Desiccant Type)
Supplement 1:	Guidelines for Measurement and Adjustment of Triethylene Glycol pH in Gas Dehydration Facilities

References

See Page 10 for list.

Responsibility for Implementation

Manager, Gas System Maintenance Department (GSM)

Contact for Further Information

[redacted]
System Standards Management
Gas System Technical Support (GSTS)
Outside: [redacted]
Company
Internet: [redacted]
(standards & policies)

[redacted]
Station Engineering
Gas System Maintenance
Outside: [redacted]
Compan
Internet: [redacted]
(engineering & maintenance practices)

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Pipeline Engineering
Gas System Maintenance
Outside: [redacted]
Company
Internet: [redacted]
(gas gathering procedures)

[redacted]
Pipeline Engineering
Gas System Maintenance
Outside: [redacted]
Compan
Internet: [redacted]
(internal corrosion program)

Approvals and Authorizations

[redacted] *6/4/98*

[redacted] Manager, Gas System Technical Support Date

[redacted] *6/3/98*

[redacted] Manager, Gas System Maintenance Date

Gas Quality Requirements

Natural gas entering PG&E's gathering, transmission and distribution pipeline systems shall meet the gas quality specifications summarized in Table 1 below. These specifications for gas supply contracts are described in detail in CGT Engineering Guideline EG 4360, "Summary of Gas Quality Specifications" (under development).

Table 1 Gas Quality Specifications

Specification	Maximum Limits	Discussion
Free liquids	none	Prevents corrosion, metering and utilization problems
Water Vapor	7 lb./MMscf	Prevents hydrate formation and corrosion problems
Hydrocarbon Dew Point	not to exceed 45 °F at a specified pressure	Prevents hydrocarbon liquid dropout, metering and utilization problems
Case 1	not to exceed 45 °F at the delivery pressure	For gas delivered at 400 psig or less
Case 2	not to exceed 45 °F at a pressure of 400 psig	For gas delivered higher than 400 psig
Hydrogen Sulfide	0.25 grains/100 scf	Legal limit in California per General Order 58 A
Total Sulfur	5 grains/100 scf	Legal limit in California per General Order 58A
Carbon Dioxide	1 or 3 % by volume	Carbon dioxide in the gas affects pipeline corrosion.
Case 1	3 % by volume	This limit applies to "dry" gas meeting the 7 lb./MMscf water vapor specification above.
Case 2	1 % by volume	This limit applies to "wet" gas that exceeds the 7 lb./MMscf water vapor specification above.
Dust, gums, etc.	none	Prevents utilization problems

Gas Quality Requirements (cont.)

Natural gas must be conditioned so that it can flow safely and reliably from the wellhead to the transmission and distribution system. Equipment needed to condition the gas include: drips, gas-liquid separators, dehydrators and corrosion inhibitor injection units.

If at any time any gas supply does not meet the gas quality specifications above, the responsible GSM District foreman or Distribution and Customer Service (DCS) Gas Operating Supervisor shall notify Gas System Operations (GSO) who will coordinate communication between the CGT Gas Quality On-Call Group (see Appendix A, "Glossary and Definition of Terms"), the appropriate suppliers and the affected Areas.

Corrective measures, which may include shutting off the out-of-specification gas supply, shall be taken in accordance with CGT Recommended Practice RP 4361, "Gas Quality and Odorization Upset Emergency Notification and Contingency Procedures" (under development).

Requirements For Control And Removal Of Free Liquids

All gases entering PG&E's gas gathering or transmission and distribution systems shall contain no free liquids. (Refer to Appendix A for definition of common terms used in this document.)

A source that delivers free liquids with the gas stream shall be immediately controlled by formally notifying the responsible producer to eliminate the cause of liquid production and/or by shutting off the source after obtaining clearance from GSO in accordance with approved PG&E notification procedures (CGT RP 4361, will have detailed procedures).

Automatic Liquid Shut-Off (ALSO)

When free liquids are suspected to be entering PG&E's system, an Automatic Liquid Shut-Off (ALSO) device or equivalent equipment can be installed which on detection of liquids will shut off delivery of gas into the PG&E system. Refer to Gas Standard and Specifications G-44 (under development) and J-45 (pending revision) for detailed installation and maintenance procedures for the ALSO device.

Drips and Gas-Liquid Separators

When free liquids are known to be present or are suspected to have condensed in the transmission and distribution system, the Districts should consider installing liquid removal facilities such as drips and gas-liquid separators at effective locations. If liquids are known to have accumulated in certain segments of the pipeline, a pigging program should be pursued.

The decision to install liquid removal facilities should be based on customer and/or operational impact, including internal corrosion mitigation and cost.

Selection of a proper drip or separator design, type and size can be determined by consulting the "Engineering Guidelines for Selection of Gas Drips, Gas-liquid Separator, Dehydration and Associated Equipment" (under development).

Gas-liquid separators shall be monitored at least monthly to ensure proper operation. Maintenance of gas-liquid separators shall be performed in accordance with the equipment manufacturer's recommendations.

Offset and drop leg drips, bottom-tapped drains, and siphon drips equipped with manually controlled liquid dump valves shall be drained periodically to prevent excessive accumulation of liquids in the pipeline. Frequency of draining shall be determined by the historical liquid volume experienced at each location and the corrosivity of the liquids (refer to the guidelines in the *CGT Internal Corrosion Manual* for testing and determining the corrosivity of liquids).

Similarly, offset and drop leg drips equipped with automatically controlled liquid dump valves and liquid storage tanks shall be inspected periodically for proper operation and in accordance with inspection requirements specified in any relevant environmental and safety plans for the facility.

For detailed procedures for handling, transportation and disposal of liquids removed by drips and gas liquid separators, refer to the *CGT Environmental Compliance Manual*. Contact the local Environmental Consultant for copies of these manuals.

Requirements For Internal Corrosion Control

Corrosive gas may not be transported by pipeline unless the corrosive effect of the gas on the pipeline has been investigated and steps have been taken to minimize internal corrosion. These steps may include the following: removal and control of liquids from entering the pipeline, and use of appropriate corrosion inhibitors to treat residual liquids that may be present in the pipeline section.

Whenever any section of the pipeline is removed from a pipeline for any reason, the internal surface must be inspected for evidence of corrosion. If internal corrosion is found, the pipe adjacent to the section must be investigated to determine the extent of internal corrosion. If additional corrosion is found in the adjacent pipe, the damage must be evaluated in accordance with ASME B 31G and repaired or replaced if necessary.

The industry standard software RSTRENG furnished by the A.G.A. should be used to evaluate the corrosion data. Records of each inspection shall be documented on Form 62-4060a, "Leak Survey, Inspection and Repair Report for Unscheduled Repair or Response."

Regardless of whether any section of pipeline has been removed for inspection, if evidence of internal corrosion in the pipeline is found or is suspected through analysis of internal pipeline environment liquids, steps should be taken to minimize and monitor internal corrosion (refer to the guidelines in the *CGT Internal Corrosion Manual*).

Requirements for Dehydration of Instrument Gas Supply

Instrument gas supply racks at all locations in the gas gathering, transmission and distribution systems shall be equipped with suitable dehydration equipment and filters to protect the instruments from freezing and/or being clogged with any solids or deposits. Refer to Gas Standard and Specifications G-40 for detailed design, installation and maintenance of instrument gas dehydrators.

Requirements For Gas Dehydration Facilities

Natural gas entering PG&E's transmission and distribution system shall be dehydrated to a level not exceeding 7 pounds of water vapor/MMscf . Exceptions to this specification may be allowable depending on the gas delivery location, pressure, gas flows and thorough evaluation by GSM, GSO and the affected Areas. Exceptions require the approval of the GSM District Foreman, GSO and the affected Areas.

Water Content or Water Dew Point Tests

Water content measurements shall be taken and recorded in the station log at least monthly at the points of entry of out-of-state gas into the gas system and at any point along pipelines where additional undehydrated gases enter a pipeline transporting dehydrated gas.

Refer to Gas Standard and Specifications N-93, "Water Content of Typical Saturated Natural Gas" to estimate the amount of water vapor that can be in saturation with the gas at various temperatures and pressures. This nomograph can also be used to convert water dew point temperatures to units such as pounds of water per MMscf of gas at a given pressure.

Gas Dehydration Facilities Monthly Maintenance

Monthly maintenance and operation procedures of glycol dehydration facilities shall include: water vapor dew point measurement on both inlet and outlet gas from the dehydrator; checking the condition of the glycol, checking pump operations; checking flange fittings, connections, etc. for leaks; checking instrumentation for proper operation.

Dry desiccant-type dehydration facilities shall also be inspected at least once a month and maintained in accordance with manufacturer's recommendations.

Each District shall maintain monthly records of the following information:

a) Monthly dew point readings at gas dehydration locations

b) Location and quantities of free liquids removed each month from pipeline gathering, transmission and distribution systems.

c) Action taken by the responsible supervisor to correct any abnormal operating conditions of gas conditioning facilities.

This information shall be recorded on the appropriate Dehydrator Station Inspection Report, Form 62-3085a or 62-3085b (Exhibits 2 and 3). Reports shall be distributed within the District and the affected Areas as required for proper surveillance and follow up. A copy of this report with the GSM District Foreman's or DCS Gas Operating Supervisor's review and approval also shall be forwarded to the GSTS/Mapping & Records Section.

Note: The forms and procedure described above are to be used until the appropriate modules in CGT's Maintenance Management System are in place. When CGT's Maintenance Management System is operational, dehydration facility inspections shall be recorded in that program.

Water vapor dew point tests shall be performed at least monthly with dew point analyzers approved by CGT. These tests shall be performed only by trained personnel. For a list of approved dew point analyzers and details as to the appropriate type(s) of analyzer for a given application, refer to CGT Recommended Practice RP 4362, "Maintenance and Operation of Water Dew Point Instruments for Gas Pipeline Applications."

Maintenance of the Triethylene Glycol Solution

Monthly Inspection

The condition of the triethylene glycol solution used in gas dehydration shall be evaluated as follows:

a) The pH of the triethylene glycol (TEG) solution shall be measured every month using a properly calibrated pH meter and a 50:50 mixture of the glycol with distilled water. The pH of the glycol is an indicator of its corrosivity. The desired pH range for the TEG is 7.0 to 8.0. Specific guidelines for measurement and adjustment methods of glycol pH are contained in Supplement 1.

b) Field samples of the representative "wet" and "dry" TEG solution should be analyzed at least annually so that the quality of the glycol can be monitored . As the TEG solution is used in the dehydrator for a long period of time, the TEG solution can be contaminated with hydrocarbons and other wellhead chemicals plus at elevated temperatures the TEG can also break down. Typical laboratory analysis should check for: chromatographic analysis as to % water, % hydrocarbon, % ethylene glycol, % diethylene glycol, % triethylene glycol, pH, chlorides and foaming tendency.

c) The GSM District Foreman will coordinate any laboratory analysis of the TEG solution with Technical and Ecological Services (TES)/Chemical Analysis Section.

3-Year Inspection

Based on the District's experience, but at least every 3 years, the glycol reboiler shall be drained and the fire tube pulled out and inspected for deposit buildup and cracks.

a) In conjunction with this 3-year inspection, contactor tower and reboiler internal parts, bubble caps, valves, pumps, instrumentation and controls shall be inspected for wear. Items with higher than normal failure rates (such as UV detectors, flame rods, dump valve trim, filter elements,

etc.) should be replaced at this time.

b) During the 3-year inspection, all TEG solution should be drained from the reboiler and recycled (whenever practical) or replaced. Consult the GSM Facilities Engineer or the manufacturer for cleaning and flushing procedures for the various dehydration equipment. For specific information on glycol recycling and approved glycol recycling companies, refer to the *CGT Environmental Compliance Manual*. Contact the local Environmental Consultant to arrange for recycling or disposal of spent TEG.

c) When available, the GSM District Foreman shall use the appropriate preventive maintenance modules in the CGT Maintenance Management System to record inspection and maintenance jobs frequency and job completion dates and any historical details associated with the maintenance of the dehydration equipment.

The GSM District Foreman will coordinate any purchase of fresh triethylene glycol with Materials and Fleet Department.

Maintenance of the Dry Desiccant

The condition of the dry desiccant shall be evaluated in accordance with the manufacturer's recommendations.

The GSM District Foreman will coordinate any laboratory analysis of the solid desiccant with TES/Chemical Analysis Section.

When available, the GSM District Foreman shall use the appropriate preventive maintenance modules in the CGT Maintenance Management System to record inspection and maintenance jobs frequency and job completion dates and any historical details associated with the maintenance of the dehydration equipment.

Reports and Records

Liquid removal from pipeline drips shall be recorded on the station logs and Form 62-4648, "Pipeline Patrol and Work Report" (See Exhibit 1). In addition, liquid removal from bottom-tapped drains shall be recorded on Form 62-4648 and clearly noted on the form as "Bottom-Tapped Drain." Reports should be distributed within the District and the affected Areas as required for proper surveillance and follow up. These records shall be retained at the local District office for the life of the pipeline.

Records indicating the results of each internal corrosion inspection shall be recorded on Form No. 62-4060a, "Leak Survey, Inspection and Repair Report for Unscheduled Repair or Response." These records shall be retained at the local District office for the life of the pipeline.

Monthly dehydration facility inspections recorded on Forms 62-3085a or 62-3085b, "Dehydrator Station Inspection Report" (Exhibits 2 and 3) shall be retained by the District which operates the facilities. These records shall be retained for a minimum of six years.

Responsibilities

System Standards Management

GSTS/System Standards Management section is responsible for defining the acceptable levels of free liquids and water vapor in the gas stream by soliciting input from various CGT departments and the Areas.

GSM District Foremen or DCS Gas Operating Supervisors

GSM District Foremen or DCS Gas Operating Supervisors are responsible for:

- surveying the system and determine sources of liquids,
- monitoring suspected sources of liquids,
- scheduling periodic extraction of liquids from drips and separators,
- operating and maintaining gas dehydration facilities,
- taking periodic dew point measurements,
- operate and maintain inhibitor injection facilities in the gas gathering systems,
- operating and maintaining the internal corrosion monitoring devices, and
- establishing and maintaining reports and records of all of the above.

In case of abnormal operating conditions, each District foreman is responsible for initiating action and overseeing corrective measures to resolve abnormal operating conditions (such as shutting off gas supplies that produce excessive liquids), and communicating and coordinating such actions with GSO and the affected Areas.

The Area DCS Gas Operating Supervisor (or equivalent) is responsible for communicating any abnormal conditions involving liquids collected in the gas distribution system to the appropriate GSM District Foreman and GSO so that a joint investigation can be readily conducted by both organizations to resolve the issue.

The District Foremen and DCS Gas Operating Supervisors are responsible for managing any liquids removed and collected from any liquid removal and gas conditioning equipment in their respective facilities in accordance with all applicable safety and environmental regulations. The local Environmental Consultant should be consulted for specific liquids management procedures.

GSM Facility and Pipeline Engineers

The GSM Facility and Pipeline engineer(s) and Internal Corrosion engineer are technical resources available to the GSM District foreman for engineering and auditing services involving the proper maintenance and operation of facilities that remove and control liquids and the associated gas conditioning equipment.

The GSM Facility and Pipeline engineer(s) and Internal Corrosion engineer shall review the monthly reports that are generated by the Districts and initiate corrective measures resulting from the review.

Training

Training of District gas personnel on the maintenance and operation of facilities that remove and control liquids and the associated gas conditioning equipment such as gas-liquid separation, dehydration and dew point analyzers can be arranged through the GSM Facilities Engineer.

Training of District gas personnel on the maintenance and operation of corrosion inhibitor injection facilities and monitoring instruments can be arranged through the GSM Internal Corrosion engineer.

References

1. CPUC General Orders 112E and 58A (and subsequent revisions)
2. Gas Standard & Specification G-40, "Dehydrator—Details , 3/4" Dehydrator for Instrument Lines, 1200 PSIG Design Pressure"
3. Gas Standard & Specification G-44, "Maintenance and Operation Procedures for Automatic Liquid Shut-Off (ALSO) Equipment" (under development)
4. Gas Standard & Specification N-93, "Water Content of Saturated Typical Natural Gas"
5. Gas Standards and Specifications O-16, "Corrosion Control of Facilities"
6. CGT Engineering Guideline, "Guidelines for Selection of Drips, Gas Liquid Separators, Dehydration Units and Associated Equipment" (under development)
7. CGT Engineering Guideline EG 4360, "Summary of Gas Quality Specifications" (under development)
8. CGT Recommended Practice RP 4361 "Gas Quality and Odorization Upset Emergency Notification and Contingency Procedures" (under development)
9. CGT Recommended Practice RP 4362 "Maintenance and Operation of Water Dew Point Test Instruments for Gas Pipeline Applications"
10. *CGT Environmental Compliance Guidance Manual*
11. *CGT Internal Corrosion Manual*

DEFINITIONS AND GLOSSARY OF TERMS

Acceptable Water Vapor Content of Gas in the pipeline shall not exceed 7 pounds of water vapor per million standard cubic feet of gas. By referring to the Gas Standard & Specifications N-93, this level is equivalent to a gas water vapor dew point of 32 °F for gas at 1,000 psig pressure.

Automatic Liquid Shut Off (ALSO) is a device that automatically shuts off the incoming gas entering the gas gathering system when free liquids are encountered in the incoming gas. This device is used by PG&E to demonstrate non-compliance of the gas received from a supplier with the no free liquids requirement that PG&E has in its contract with suppliers.

CGT Gas Quality On-Call Group is a technical resource which is available to GSO when corrective measures to gas quality system emergencies are needed. This group is composed of GSM, GSO, and GSTS members who understand PG&E's gas quality and odorization programs and have received training covering the gas quality incident reporting process, emergency notification, and contingency procedures.

Corrosive gas is one way of describing natural gas that contain levels of carbon dioxide or hydrogen sulfide that exceed acceptable limits. These carbon dioxide and hydrogen sulfide gases are also sometimes called acid gases because in the presence of water, they form acids or acidic solutions that are corrosive.

Free liquid is any measurable quantity of liquid, including water, hydrocarbon condensate, compressor oil, glycol, or other liquid contaminants condensed or produced into the pipeline and carried along with the gas stream.

Gas Conditioning equipment is equipment that is used to make the gas marketable and flowing safely and reliably from the wellhead to the transmission and distribution systems. Examples of gas conditioning equipment are gas-liquid separators, dehydration and corrosion inhibitor injection units.

Gas Dehydration is the removal of water vapor from the gas stream usually by contacting the gas with triethylene glycol or other hygroscopic (water absorbing) desiccants.

Hydrocarbon Dew Point is the temperature at which hydrocarbons start to condense from the gas stream at a given pressure.

Liquid removal facilities include equipment such as standard offset and dropleg drips, siphon drips, gas conditioning equipment such as gas-liquid separators and scrubbers with or without liquid storage tanks and automatic liquid dumping features.

Water Dew Point is the temperature at which water vapor starts to condense from the gas stream at a given pressure.

EXHIBIT 1

PG!E
Gas Operations
62-4648 Rev. 4/76

PIPELINE PATROL AND WORK REPORT

Note: Retain in Pipeline History File

DIVISION	DISTRICT	MAP(S) NO.

PIPE LOCATION OR WORK ASSIGNMENT:

LEAK SURVEY VISUAL/VEGETATION ☐ INSTRUMENT ☐

SPECIAL EQUIPMENT NEEDED:

MAIN PATROLLED

PIPELINE OR MAIN NO.	FROM:	TO:	MILES CAR THIS DAY:	MONTH TO DATE	MILES FOOT THIS DAY:	PATROLLED BY:

DRIP RECORD

NO.	MIN. BLOWN	LIQUID GALS.	KIND*
TOTAL			

* (W) Water; (G) Gas; (0) Oil; (D) Other

VALVES GREASED: NUMBERS

CONDITIONS FOUND THIS DAY: Brief description of conditions found and/or corrective action performed; telephone trouble, pipeline, etc.

POINTS TO OBSERVE PER S.P. 460.2-1 **Personnel patrolling the pipelines shall be alert for and report the following:**	COND. OK ✓	SEE COND. FOUND ✓
1. Land slides or threatened slides.		
2. Erosion by streams, wave action, rain, etc.		
3. Land subsidence that could affect the pipeline or main.		
4. Construction or maintenance work being done by others along the pipeline or main or encroachments on the right-of-way.		
5. Evidence of gas leakage, as indicated by vegetation, bubbles in surface water, odor, readings, etc.		
6. Needed repairs to facilities owned by company.		
7. Needed repairs to highway structures and other facilities not owned by company where public safety is a factor.		
8. Presence of survey parties or other indications of possible future work that might jeopardize the pipe line or main or change its location class.		
9. Any other factors affecting the operation or safely of the pipeline or main or other company facilities.		
10. Report any evidence of atmospheric corrosion on above ground piping.		
11. Access roads used by others occasionally, or in areas viewed by the general public, that may not be In a passable condition as established in accordance with existing agreements.		
12. Any activity which could create an unsightly condition in aesthetically sensitive areas.		

DATE	WEATHER

REVIEWED BY	DATE

ACTION TAKEN

Station Name Here

LINE NO. ___

DEHYDRATOR STATION INSPECTION FORM 19__

(*Glycol Dehydrator*

DATE		GAS DATA								GLYCOL DATA				FLUIDS ADDED			
MONTH	DAY	GAS TEMP (tower) (F)	GAS PRESS (PSIG)	INLET DEWPT TEMP . (F)	INLET WATER CONTENT (LB/MM)	OUTLET WATER CONTENT (LB/MM) (A)	WATER REMOVED (LB/MM) (B)	AVERAGE GAS FLOW (MMSCFD) (C)	MAXIMUM GAS FLOW (MMSCFD) (C)	REBOILER TEMP (F) (D)	FILTER CHANGE (SOCK) (CHARC) (E)	pH (F)	PUMP SPEED (STK/MIN) (GAL/MIN) (G)	GLYCOL (GAL)	Corrosion Inhibitor (PINT) (H)	pH Buffer (PINT) (I)	INITIALS
JAN							0										
FEB							0										
MAR							0										
APR							0										
MAY							0										
JUN							0										
JUL							0										
AUG							0										
SEPT							0										
OCT							0										
NOV							0										
DEC							0										

GLYCOL PUMP MODEL: _____

ANALYZER USED: _____

DATE OF LAST OVERHAUL / FLUSH:

FOOTNOTES:

A. Maximum allowable = 7 lb/MM (unless variance obtained)
B. Inlet - Outlet = Removed
C. From Load Center Logs
D. Desired range = 350 - 385 F
E. Change sock filter at high DP and charcoal filter every 8-10 weeks.
F. pH desired range is 7.0 - 8.0, DILUTE 50/50 with deionized water.
G. Kimray - record strokes/minute; Rototech - record gal/minute
H. CORROSION INHIBITOR- note pints or quarts added
I. pH BUFFER - note pints or quarts added

EQUIPMENT / OPERATIONAL CHANGES:

JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

EXHIBIT 3

Station Name Here

DEHYDRATOR STATION INSPECTION FORM 19__

LINE NO. __

Dry Desiccant Dehydrator

DATE		GAS DATA								DESICCANT			PRE- FILTER		
MONTH	DAY	GAS TEMP (tower) (F)	GAS PRESS (PSIG)	INLET DEWPT TEMP . (F)	**INLET** WATER CONTENT (LB/MM)	**OUTLET** WATER CONTENT (LB/MM) (A)	WATER REMOVED (LB/MM) (B)	AVERAGE GAS FLOW (MMSCFD) (C)	MAXIMUM GAS FLOW (MMSCFD) (C)	Add Desiccant (lbs) (D)	Type of Desiccant (manufacturer/type)	Stroke Dump Valve (check) (E)	Change Filter? (yes/no)	Filter Element Rating (microns)	INITIALS
JAN															
FEB															
MAR															
APR															
MAY															
JUN															
JUL															
AUG															
SEPT															
OCT															
NOV															
DEC															

DATE OF LAST TOWER FLUSH: _____

ANALYZER USED: _____

FOOTNOTES:

A. Maximum allowable = 7 lb/MM (unless variance obtained)
B. Inlet - Outlet = Removed
C. From Load Center Logs
D. As required, at high outlet DP
E. To prevent plugging of dump valve, stroke often.

EQUIPMENT / OPERATIONAL CHANGES:

JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

SUPPLEMENT 1
GUIDELINES FOR MEASUREMENT AND ADJUSTMENT OF GLYCOL, pH IN GAS DEHYDRATION FACILITIES

A. Introduction

1. By definition, pH is a measure of the acidity of an aqueous solution (lower pH means more acidic). A pH of 7.0 is neutral, pH greater than 7.0 is alkaline (or basic) and pH less than 7 is acidic. Distilled water generally has a pH of 7.0.

2. The pH of glycol solutions is a good indication of the condition of the glycol and the chemical degradation that the solution may have undergone resulting from the thermal decomposition, oxidation, and contamination of the glycol solution.

3. The desired pH range for glycols utilized in dehydration equipment is 7.0 to 8.0. A pH of 7.3 to 7.5 is ideal.

4. If corrective measures are not taken, the pH of the glycol solution in typical dehydration equipment will decrease (i.e., become more acidic) over a period of time as the unit operates. Corrosion rates of the equipment exposed to the glycol solution will then increase rapidly with the decrease in glycol pH.

5. As a result, the pH of the glycol solution should be checked periodically and noted in the Dehydration Station Inspection Report (Form 62-3085a).

B. Guidelines - pH Measurement of Glycols

1. The pH of glycols should be measured utilizing a properly calibrated (potentiometric type) pH meter. Contact the GSM Facilities engineer for a list of approved suppliers.

2. In general, calibration of the pH meter with fresh buffer solutions of pH 4.0, 7.0 and 10.0 is required prior to making any measurements. The buffer solutions are available from most chemical suppliers or from PG&E's Technical and Ecological Services(TES)/Chemical Analysis Section. Contact TES 24-hour Service Line at 8-251-3197 or (925) 866-3197.

3. Follow the operating instructions provided by the pH instrument manufacturer. Any further assistance required to service the pH meters can be requested from Gas System Maintenance Facilities engineer or Technical Ecological Services Department/Chemical Analysis Section.

   NOTE: pH paper should be used only for checking the operation of the pH meter.

4. Glycol samples should be taken from the glycol surge tank portion of the dehydration equipment

   NOTE: The sample should be allowed to cool down to ambient temperature or to at least 150 °F because pH readings change with sample temperature.

5. To get accurate measurements, the glycol sample should be diluted 50:50 with distilled water.

6. In general, gentle swirling or stirring of the sample is often necessary to stabilize the pH readings.

SUPPLEMENT 1
GUIDELINES FOR MEASUREMENT AND ADJUSTMENT OF GLYCOL, pH IN GAS DEHYDRATION FACILITIES

C. Guidelines - Adjustment of the pH of Glycols

1. As discussed in Section A.4, the pH of the glycol solution will require raising periodically as the glycol degrades with age. This pH adjustment can be accomplished by adding a glycol pH increaser to the glycol. If necessary, any of the two glycol pH decreaser below can be used to adjust the glycol pH if the glycol solution has become too basic.

   a) Glycol pH Increaser (& Corrosion Inhibitor) MC Code M490070

   b) Glycol pH Decreaser and Buffer MC Code M490069

   c) White vinegar (Glycol pH Decreaser only) available from stores

2. The frequency and quantity of the addition of any of these chemicals is determined by pH measurements of the glycol solution.

3. The chemical should be added to the glycol surge tank of the reboiler premixed in a proportion of one quart of chemical to five gallons of dry glycol.

4. Allow the chemical to disperse into the bulk of the solution and for the whole glycol solution to circulate at least once through the dehydration equipment.

5. Measure the resulting pH of the glycol solution to evaluate the effect of the addition of the chemical.

6. Repeat these procedures until the desired pH range of 7.0 to 8.0 is achieved.