

# SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

## **RULE 4408 - GLYCOL DEHYDRATION SYSTEMS**

*(Adopted December 19, 2002)*

### 1.0 Purpose

The purpose of this rule is to limit VOC emissions from glycol dehydration systems. This rule also specifies the administrative and recordkeeping requirements, and the test methods.

### 2.0 Applicability

This rule applies to any glycol dehydration system with a glycol dehydration vent that is subject to permitting requirements pursuant to Regulation II (Permits).

### 3.0 Definitions

- 3.1 Flare: a direct combustion device in which air and all combustible gases react at the burner with the objective of complete and instantaneous oxidation of the combustible gases.
- 3.2 Flash Tank: a tank used to remove gases from the warm rich glycol used during the dehydration process and to reduce VOC emissions from the glycol dehydration vent(s). Flash tanks are also known as Phase Separators, Flash Separators, or Flash Tank Separators.
- 3.3 Glycol: a liquid desiccant commonly used to remove water vapor from natural gas streams. The most common forms of glycol used for natural gas dehydration include, but are not limited to: triethylene glycol (TEG), diethylene glycol (DEG) and ethylene glycol (EG).
- 3.4 Glycol Dehydration Still: the part of the glycol dehydration system in which rich moisture and hydrocarbons are removed from the glycol by simple distillation with heat from the reboiler. The still is also known as the stack or stripper.
- 3.5 Glycol Dehydration System: a multi-component system in which water is absorbed from a natural gas stream by coming in direct contact with glycol, the moisture is removed from the glycol, and the glycol is reused.
- 3.6 Glycol Dehydration Vent: any vent on the glycol dehydration system through which hydrocarbon and steam are emitted to the atmosphere or to a VOC control device. This can include the still vent and the flash tank vent.

- 3.7 Incinerator: an enclosed combustion device that is used for destroying organic compounds.
- 3.8 Leak:
- 3.8.1 At a Crude Oil and/or Gas Production facility, a leak is the following:
- 3.8.1.1 The dripping at a rate of more than three (3) drops per minute of liquid containing VOCs; or
- 3.8.1.2 A reading as methane in excess of 20,000 ppm above background when measured at a distance of one (1) centimeter from the potential source in accordance with the test method in Section 6.3.2.
- 3.8.2 At a Natural Gas Processing facility, a leak is the following:
- 3.8.2.1 The dripping at a rate of more than three (3) drops per minute of liquid containing VOCs; or
- 3.8.2.2 A reading as methane in excess of 10,000 ppm above background when measured at a distance of one (1) centimeter from the potential source in accordance with the test method in Section 6.3.2.
- 3.9 Reboiler: a burner that supplies heat to remove the water vapor and hydrocarbons from the rich glycol in the still by simple distillation. Reboilers are also known as regenerators.
- 3.10 Smokeless: any emission that meets the requirements of Rule 4101 (Visible Emissions).
- 3.11 Vapor Recovery System: A vapor gathering system, which may include a condenser, separator, or tank, capable of collecting the hydrocarbon vapors and gases discharged and a vapor disposal system capable of processing such hydrocarbon vapors and gases so as to prevent their emission into the atmosphere.
- 3.12 VOC: as defined in Rule 1020 (Definitions).

#### 4.0 Exemptions

Except for complying with Section 6.1.3, the requirements of this rule shall not apply to any glycol dehydration system that:

- 4.1 is permitted to operate less than 200 hours per year, as verified and recorded by a continuous measurement of an operating parameter of the unit or by the cumulative measurement of the operating hours of the unit, or

- 4.2 is permitted to dehydrate less than 5 million standard cubic feet (MMSCF) of gas per year as verified and recorded by the cumulative measurement of gas dehydrated annually.

## 5.0 Requirements

- 5.1 No person shall operate a glycol dehydration system unless the VOC emissions from the glycol dehydration vents are controlled using one of the following:
- 5.1.1 A system that directs all vapors to a vapor recovery system, a fuel gas system or a sales gas system, or
  - 5.1.2 A system in which VOC emissions are combusted by a flare, incinerator, reboiler, or thermal oxidizer. This system shall have all of the following features, as a minimum:
    - 5.1.2.1 Operate continually in a smokeless mode,
    - 5.1.2.2 Electronically controlled ignition system with a malfunction alarm system if the pilot flame fails,
    - 5.1.2.3 Liquid knock-out system to condense any condensable vapors, and
    - 5.1.2.4 Sight glass ports, if the flame is not visible.
  - 5.1.3 Any other emission control system that controls glycol dehydration vent VOC emissions by at least 95 percent, averaged over 1 hour, or that controls glycol dehydration vent VOC emissions to a level no higher than 1.7 pounds of VOC per million dry standard cubic feet of gas dehydrated, averaged over 24 hours.
    - 5.1.3.1 The control efficiency shall be determined by comparing the measurements of VOC emissions from the uncontrolled glycol dehydration vent with measurements of VOC emissions from the emission control system. For both measurements, the glycol dehydration system shall operate under similar conditions for the following parameters: glycol flowrate, reboiler temperature, gas flowrate, and gas moisture removal efficiency.
    - 5.1.3.2 Systems subject to this requirement shall test, according to the methods listed in 6.2, 6.3.1, and 6.4, for compliance upon installation and not less than once every 24 months thereafter.
- 5.2 The condensed hydrocarbon liquid stream from the glycol dehydration vent shall be stored and handled in a manner that will not cause or allow evaporation of VOC to the atmosphere.

5.3 All control systems shall be maintained in a leak-free condition. A leak-free condition shall be determined by utilizing the test method in Section 6.3.2.

## 6.0 Administrative Requirements

### 6.1 Recordkeeping

6.1.1 The operator of any glycol dehydration system subject to this rule shall maintain monthly records of the amount of gas dehydrated (MMSCF).

6.1.2 The operator of any glycol dehydration system subject to this rule shall retain the following information to assist with rule compliance:

6.1.2.1 Facility name, APCD permit number,

6.1.2.2 Location, size of glycol dehydrator reboiler (MMBTU/hr), and type of glycol used,

6.1.2.3 Description of any installed VOC control system,

6.1.2.4 Flow diagram of dehydrator and any VOC controls,

6.1.2.5 Maintenance records of the VOC control system,

6.1.2.6 Reports of source tests as required by Sections 5.1.3, and

6.1.2.7 All records necessary to document the inputs to and outputs of GRI-GLYCalc™ software, if used.

6.1.3 Owners and operators of glycol dehydration systems operating under an exemption in Section 4.0, shall maintain:

6.1.3.1 hours of operation per month for the glycol dehydration system operating under the exemption in Section 4.1, or

6.1.3.2 records of total gas dehydrated annually (MMSCF) operating under the exemption in Section 4.2.

6.1.4 The records listed in Sections 6.1.1, 6.1.2, and 6.1.3 shall be retained on the premises for a period of not less than five years and made available to any District representative upon request.

### 6.2 Glycol Dehydration Vent Testing

VOC emissions from glycol dehydration vents shall be determined using the Glycol Material Balance Method described in Section 6.2.1, or tested according to the methods listed in Section 6.2.2.

#### 6.2.1 Glycol Material Balance Method

- 6.2.1.1 This method may be used only if a flash tank is operating upstream of the glycol dehydration vent.
- 6.2.1.2 This method is based on a material balance calculation, and glycol shall not be considered to be a VOC. The glycol circulation rate shall be based on the rated pump output and/or flow rate measurements.
- 6.2.1.3 Samples shall be collected at process pressures using evacuated stainless steel cylinders connected to bypass loops on the rich and lean glycol lines. The glycol shall be circulated through the cylinders for a minimum of 5 minutes. The liquid and gas phases of the glycol samples shall be analyzed separately, and the volumes of the liquid and gas present in the cylinders shall be measured using the following air displacement apparatus:
  - 6.2.1.3.1 Place sample cylinder in a vertical configuration with bottom connected to the glycol drain.
  - 6.2.1.3.2 The top of the cylinder is connected to a three-way valve with one exit leading to a tedlar bag for gas collection and the other leading to a 1 liter graduated burette (initially filled with distilled water) followed by a 2 liter separatory funnel.
- 6.2.1.4 Gas-phase samples shall be analyzed for VOC using gas chromatography (GC) according to ASTM E260. Gas samples shall be injected directly in the gas chromatograph followed by a photo-ionization detector (PID) or flame ionization detector (FID) analyzer.
- 6.2.1.5 For the liquid samples, EPA Test Methods SW-846 shall be followed for sample preparation. Analysis of the sample for VOC content (Total Petroleum Hydrocarbons) shall be determined by EPA Method 8260. All C6 through C9 compounds shall be quantified and should include: alkylpentanes, cyclopentanes, alkyl hexanes, cyclohexane, toluene, alkyl benzenes, and xylene.

## 6.2.2 Vent Emission Testing

6.2.2.1 VOC emissions from glycol dehydration vents shall be determined according to a test protocol, which shall be submitted to the District and approved in writing by the APCO prior to testing. Such protocols shall be suitable to the specific unit to be tested and shall provide for:

6.2.2.1.1 The difficulties of determining VOC in the presence of high steam concentrations,

6.2.2.1.2 Either total capture of condensible and noncondensable exhaust or isokinetic sampling of a representative portion thereof, if the glycol dehydration unit processes 15 MMSCFD or more natural gas, on a dry basis,

6.2.2.1.3 Condensation of steam and retention of condensate and a representative portion of non-condensable gas analysis,

6.2.2.1.4 Determination of VOC concentration in non-condensable gas by EPA Method 25, 25A, 25B, or 18,

6.2.2.1.5 Determination of VOC in condensate by EPA Method 8260 (Total Petroleum Hydrocarbons),

6.2.2.1.6 Isokinetic sampling and separation of condensible gases which conforms to EPA Method 5, and

6.2.2.1.7 Exhaust flow rate measurements which conform to EPA Method 2 or 2A.

### 6.3 Emission Control System Testing

6.3.1 The VOC emissions from the emissions control system in Section 5.1.3 shall be determined as follows:

6.3.1.1 Measurement of VOC vapor concentration shall be determined by EPA Method 25, 25A, 25B, or 18, and

6.3.1.2 Measurement of vapor flow through pipes shall be determined by EPA Methods 2 or 2A.

6.3.2 A leak-free condition shall be determined by measuring the gas leak in accordance with the procedures in EPA Method 21.

6.4 Utilization of the Gas Research Institute's GLYCalc™ software

6.4.1 The GRI-GLYCalc™ software, version 3.0 or higher, may be used to determine flow rates in lieu of methods listed in Section 6.2.2.1.6, 6.2.2.1.7, and 6.3.2.

6.4.2 APCO and EPA approval must be gained prior to the use of the GRI-GLYCalc™ software.

6.5 All ASTM test methods referenced in this Section are the most recently EPA-approved version that appears in the Code of Federal Regulations as Materials Approved for Incorporation by Reference.

7.0 Compliance Schedule

All owner/operators shall comply with the applicable provisions of this rule by December 31, 2003.

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