

# Directive 039

July 10, 2006

## Revised Program to Reduce Benzene Emissions from Glycol Dehydrators

The Alberta Energy and Utilities Board and Alberta Environment have approved this directive on July 10, 2006.

[Original signed by]

M. N. McCrank, Q.C., P.Eng.  
Chairman  
Alberta Energy and Utilities Board

[Original signed by]

C. Peter Watson, P.Eng.  
Deputy Minister  
Alberta Environment

This directive sets out new requirements for the reduction of benzene emissions from glycol dehydrators and replaces the joint Alberta Energy and Utilities Board (EUB) and Alberta Environment (AENV) *Informational Letter (IL) 2001-07: Revised Program to Reduce Benzene Emissions from Glycol Dehydrators*. These requirements will also be incorporated into EUB Directive 060: *Upstream Petroleum Industry Flaring, Incineration, and Venting*, (formerly *Guide 60: Upstream Petroleum Industry Flaring Guide*).

With the issuance of this directive, the EUB and AENV have established mandatory requirements to ensure continued reductions of benzene emissions to reduce potential impact on the public.

Licensees must comply with the following new requirements effective January 1, 2007:

- 1) When evaluating dehydration requirements in order to achieve the lowest possible benzene emission levels, licensees must use the Decision Tree Process in Appendix A of the Canadian Association of Petroleum Producers (CAPP) document *Best Management Practices for Control of Benzene Emissions from Glycol Dehydrators*, June 2006 (*Benzene Control BMP*) and retain appropriate analysis documentation for review by regulatory agencies. Licensees must follow the public consultation process outlined in the Benzene Control BMP.
- 2) Licensees must ensure that all their dehydrators meet the following benzene emission limits.

Date Dehydrator Installed or Existing Dehydrator Relocated	Benzene Emission Limits
Prior to January 1, 1999	
• Greater than 750 m to permanent resident or public facility	5 tonnes/yr
• Less than 750 m to permanent resident or public facility	3 tonnes/yr
January 1, 1999, to January 1, 2007	3 tonnes/yr
After January 1, 2007	1 tonne/yr

### ***Specific Benzene Emission Limits***

- i) If more than one dehydrator is located at a facility or lease site, the cumulative benzene emissions for all dehydrators must not exceed the limit of the oldest dehydrator on site. Modifications may be required to existing unit(s) to meet the site limit.
  - ii) Any new or relocated dehydrators added to an existing site with dehydrator(s) must operate at a maximum benzene emission limit of 1 tonne/yr or less. The cumulative benzene emissions must not exceed the limit of the oldest dehydrator on site.
  - iii) For dehydrators that are only in operation for a portion of the year, the daily emission rate must not exceed the above annual benzene emission limits divided by 365. (For example, for a dehydrator with an annual benzene emission limit of 3 tonnes that only operates for six months of the year, the maximum annual emission limit would be 1.5 tonnes or a maximum daily emission rate of 8.2 kg/day.) See Section 2.3 of the *Benzene Control BMP* for details on calculating and reporting of emissions from dehydrators that only operate a portion of the year.
- 3) Licensees must complete a Dehydrator Engineering and Operations Sheet (DEOS) (see Attachment 1) to determine the benzene emissions from each dehydrator. This sheet summarizes optimum operating conditions to minimize benzene emissions and must be posted at the dehydrator for use by the operations staff and inspection by the EUB. The DEOS must be revised annually (each calendar year), upon relocation, or upon a change in status (resume operation, shut-in, bypassed) of the dehydrator.
  - 4) Licensees must complete and submit an annual Dehydrator Benzene Inventory List (see typical inventory list in Attachment 2), listing all the licensees' dehydrators, as set out in the June 2006 CAPP *Benzene Control BMP* by July 1 each year. Copies of the annual Dehydrator Benzene Inventory List form are available from CAPP at [www.capp.ca](http://www.capp.ca). This information must be submitted to the EUB through the Multi-Stakeholder Benzene Technical Advisory Team (Benzene TAT) (by mail to Attention: Manager of Alberta Operations, CAPP, Suite 2100, 350 - 7 Avenue S.W., Calgary, Alberta T2P 3N9; or by e-mail to [benzene.tat@capp.ca](mailto:benzene.tat@capp.ca)).

The latest version of the *Benzene Control BMP* is available from CAPP at <http://www.capp.ca/raw.asp?x=1&dt=PDF&dn=105760>. This document describes procedures for selecting appropriate dehydration, calculating emissions, maintaining records, and reporting reductions of benzene emissions from glycol dehydrators. Questions regarding the document and the processes it outlines may be directed to CAPP at (403) 267-1100 or by e-mail at [benzene.tat@capp.ca](mailto:benzene.tat@capp.ca).

### **Compliance and Enforcement**

These requirements will be subject to compliance review by the EUB. Regulatory requirements are those rules that industry has an obligation to meet and against which the EUB may take enforcement action in cases of noncompliance. For the purpose of *Directive 039*, noncompliance events are listed in Attachment 3. See the EUB Web site at [www.eub.ca](http://www.eub.ca) and *Directive 019: EUB Compliance Assurance—Enforcement* for details regarding EUB compliance and enforcement.

AENV may also review for compliance, and failure to comply may result in the issuance of Environmental Protection Orders (EPO), as outlined in the Alberta *Environmental Protection and Enhancement Act*.

## Background

Benzene is classified as a toxic substance under the *Canadian Environmental Protection Act* and as a Group 1 carcinogen by the International Agency for Research on Cancer. As a non-threshold carcinogen, there is considered to be some health risk at any level of exposure. As a result, benzene emissions must be managed to achieve the lowest levels practicable to minimize human exposure. A Benzene Workplace Health and Safety Sheet (Attachment 4) was prepared by the Benzene TAT to promote awareness of benzene hazards and methods to minimize exposure for operations staff.

As described in *IL 2001-07*, the oil and gas industry has had a Benzene Reduction Program in place since 1997. The program is managed by the Benzene TAT, which includes representatives from Health Canada, CAPP, Environment Canada, EUB, AENV, B.C. Environment, and Saskatchewan Environment. A recent status report shows that only 26 per cent of new dehydrator installations have used the Decision Tree Process outlined in the November 2000 CAPP *BMP for Control of Benzene Emissions* to optimize dehydrator performance to reduce benzene emissions to as low a level as possible.

While the Benzene TAT is encouraged by the benzene emission reductions achieved from glycol dehydrators, it has determined that new requirements are needed to maintain current reductions achieved, strive for continuous improvement in controlling emissions, select appropriate dehydration, improve reporting of emissions, and operate dehydrators more efficiently. The new requirements in this directive should result in dehydrators being operated at optimum conditions to ensure that emissions and potential health effects from benzene are minimized.

## Contact

Any comments or questions with respect to this directive should be directed to the EUB's Environment Group at (403) 297-8330 or by e-mail at [eub.enviroservices@gov.ab.ca](mailto:eub.enviroservices@gov.ab.ca) or to the AENV Environmental Policy Branch at (780) 427-6869 or by e-mail at [randy.dobko@gov.ab.ca](mailto:randy.dobko@gov.ab.ca).

(This sheet must be revised annually, or upon dehydrator relocation or change in status, and posted at the dehy.)

Technical Contact: Print Name/Phone #/email: \_\_\_\_\_

Revision Date (dd-mm-yyyy): \_\_\_\_\_ Facility or Site Name: \_\_\_\_\_

Licensee Name: \_\_\_\_\_ Operator Name: \_\_\_\_\_

Gov't Licence No: \_\_\_\_\_ Location, DLS: - - - W (or NTS: \_\_\_\_\_)

Installation Type:  Well  Compressor  Battery  Plant  Cavern  Other DEHY Type:  TEG  DEG  EG

Date Dehy installed/relocated? (dd-mm-yyyy): \_\_\_\_\_ Current Dehy Status:  Producing  Shut-In  
 Bypassed  Other: \_\_\_\_\_ Date Dehy Status Changed? (dd-mm-yyyy): \_\_\_\_\_

Typical number of operating days per year: \_\_\_\_\_ Number of dehy's on site: \_\_\_\_\_

Distance to Closest Resident (if < 750 metres): \_\_\_\_\_ Normal Gas Flow Rate to Dehy: (e<sup>3</sup> m<sup>3</sup>/d): \_\_\_\_\_

Benzene Content in Gas to Dehy (mole %): \_\_\_\_\_ (If zero, Dehy operations sheet must still be posted)

Feed gas benzene determination method:  Analysis Date of analysis (dd-mm-yyyy): \_\_\_\_\_

Other (describe): \_\_\_\_\_

Glycol Pump Make/Model# \_\_\_\_\_ Normal Pump Speed: \_\_\_\_\_ RPM or SPM

Plunger diameter/stroke length: \_\_\_\_\_ inches, or \_\_\_\_\_ mm

Normal Glycol Circulation: \_\_\_\_\_ USgpm Normal Absorber Temp: \_\_\_\_\_ °C Normal Absorber Press: \_\_\_\_\_ kPag

Emission Calculation Method:  GRI GLYCalc™ Version #: \_\_  HYSYS™  ProSim™  Total Capture

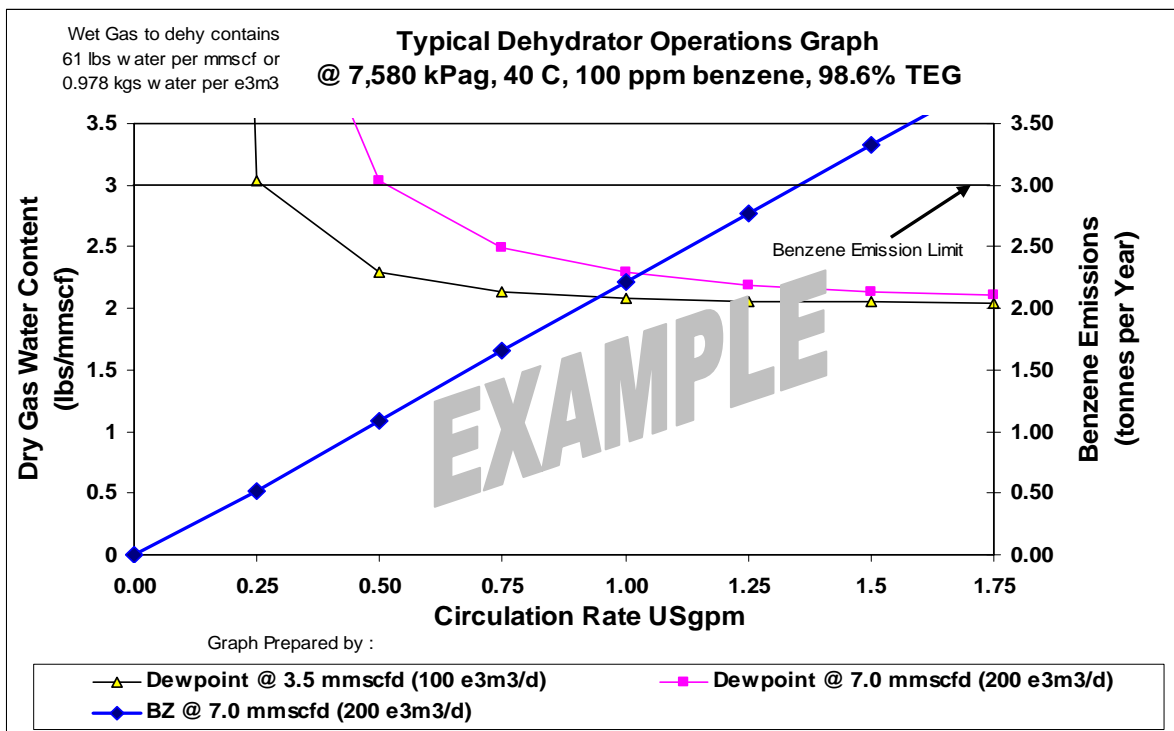
Rich/Lean Glycol  Other—Describe: \_\_\_\_\_

Benzene Emission Controls:  No  Yes Describe (condenser, tank, incinerator, flare, other): \_\_\_\_\_

Dehy decision tree analysis (DTA) completed?:  No  Yes (mandatory for all new or relocated dehy's)

When operating, average benzene emissions (in tonnes/yr)\* Before Controls: \_\_\_\_\_ After Controls: \_\_\_\_\_

**\*Note:** In accordance with EUB Directive 039, this dehydrator must be operated below \_\_\_\_\_ tonnes/yr benzene emissions. If multiple dehy's exist on this site, the aggregate benzene emissions must be less than \_\_\_\_\_ tonnes/yr, which is the maximum per year allowed for the oldest dehy on site.







Attachment 3 Noncompliance Enforcement Ratings

<b>Enforcement Rating</b>	<b>Noncompliance Event</b>
High	Dehydrator or site benzene emissions over the limits
Low	Failure to complete Decision Tree analysis
Low	Dehydrator Engineering and Operations Sheet (DEOS) not done, incomplete/inaccurate, and/or not posted
Low	Failure to submit annual Dehydrator Benzene Inventory List to Benzene TAT

**If all noncompliance items are not addressed, escalating consequences will be applied in accordance with *Directive 019: EUB Compliance Assurance—Enforcement (Directive 019)*. Operators should also be aware that if they are identified as “persistently noncompliant,” enforcement will be applied as outlined in *Directive 019*.**

The EUB encourages companies to voluntarily self-disclose any noncompliances as described in Section 6 of *Directive 019*.

### **What is benzene?**

Benzene, a colourless, flammable liquid with a sweet odour, is classified as a toxic substance under the *Canadian Environmental Protection Act*. As a non-threshold carcinogen, it is considered to be of some health risk at any level of exposure. It is also classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC). It is to be managed by reducing human exposure to the extent possible and practicable.

### **Where is benzene found in the workplace?**

Crude oil and natural gas condensate contain benzene. The concentration varies depending on the geology and location of the well site. Benzene and other hydrocarbons may be released from stacks, flares, glycol dehydrators, hydrocarbon storage facilities, and other operations that involve crude oil or condensate. Occupational exposure to benzene in the upstream oil and gas industry occurs mainly through the use of glycol dehydrators as benzene is removed from the gas stream during dehydration.

### **How can workers become exposed to benzene?**

Workers may become exposed by inhalation or by direct contact with the skin. This may occur when changing filters and pumps and when handling rich glycol at dehydrators. Although readily absorbed after inhalation, benzene is not easily absorbed through skin contact. The absorption of benzene vapour through the skin is unlikely to be significant at concentrations below 25 ppm.

### **What are the health risks of benzene exposure?**

#### ***Short-Term Acute Exposure***

Acute exposures (greater than 3200 µg/m<sup>3</sup> or 1000 ppb over an 8-hour period) are unlikely during routine operations and worker activities. Limited studies suggest that acute exposure to benzene may depress the central nervous system. Common symptoms at 50 to 150 ppm are drowsiness, dizziness, headache, nausea, vomiting, sleepiness, fatigue, nose and throat irritation, slurred speech, loss of balance, and disorientation. Exposure above 20 000 ppm for 5 to 10 minutes can cause death.

#### ***Long-Term Chronic Exposure***

Chronic exposure may result in a range of health effects, depending on the dose and frequency of exposure. Health effects of prolonged exposure relate mainly to the skin and blood. Prolonged and repeated contact with benzene can cause redness, drying, and cracking of the skin. Prolonged exposure above workplace limits may suppress the production of red blood cells, white blood cells, and clotting cells by damaging bone marrow. Benzene may also increase the incidence of a specific type of leukemia (acute myelogenous leukemia) and other forms of leukemia and lymphomas.

Exposure to benzene along with other substances may enhance health effects. Exposure to benzene and ethanol can increase the effects on the blood system. Exposure to toluene and benzene can reduce the body's ability to remove benzene, as toluene slows the rate of clearance of benzene by competing for metabolic pathways.

### **How can you avoid exposure to benzene?**

#### ***Engineering Controls***

- Optimize glycol circulation.
- Implement alternatives for hydrate control and dehydration, such as using a flash tank separator, a line heater, or solid desiccant or molecular sieve plants.
- Ensure that equipment and barriers for preventing exposure are working and maintained according to specifications.

***Administrative controls***

- Verify that safe work practices are formalized, reviewed, and updated.
- Ensure that employees are properly trained in safe work practices.
- Monitor air to ensure that the benzene concentration does not exceed the occupational exposure limit.

***Personal protective equipment***

- Use close-fitting goggles or a National Institute for Occupational Safety and Health (NIOSH)-approved supplied-air respirator (SAR) with a full face mask that includes an end-of-use indicator.
- Wear, wash, and maintain chemical-resistant clothing (gloves, coveralls, boots) appropriate for conditions of use.