

DEPARTMENT OF ENVIRONMENTAL QUALITY DIVISION OF AIR QUALITY

Proposed Revisions to the Chapter 6, Section 2
Oil and Gas Production Facilities Permitting Guidance

August 2018
Technical Support Document



WYOMING



WYOMING DEPARTMENT OF
ENVIRONMENTAL
QUALITY

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Executive Summary

This report summarizes the best available control technology (BACT) analyses completed to determine the technical feasibility and economical reasonableness of proposed revisions to the Presumptive BACT requirements under the Chapter 6, Section 2 Oil and Gas Production Facilities Permitting Guidance (O&G Guidance). The Division examined the economic reasonableness and technical feasibility of controls and emission reports/inventories in order to establish the appropriate presumptive BACT (P-BACT) threshold. Based on an analysis of all the available data the following changes are proposed for the 2018 O&G Guidance:

Introduction

The O&G Guidance, introduced in 1997, serves as a supplement to the Wyoming Air Quality Standards and Regulations (WAQSR) New Source Review permitting program. It describes a permitting procedure tailored to Wyoming's O&G producers that allows for the construction and startup of new facilities to begin prior to issuance of an Air Quality permit. In order to construct and operate facilities prior to permitting, operators must install specific pollution control equipment and follow certain operational procedures that meet BACT requirements. This is the Presumptive BACT (P-BACT) permitting process.

The O&G Guidance has been revised eight (8) times since 1997 to incorporate updated P-BACT requirements. The proposed revisions are directed at intermittent pneumatic controllers, clarifying the definition of the term "modification," and establishing fugitive emission monitoring.

Whether or not a piece of equipment, operating procedure or emission control device meets BACT requirements depends on technical feasibility and cost effectiveness. The technical feasibility for most of the proposed P-BACT requirements already have been established since all are currently in use. To determine economical reasonableness cost analyses were performed for fugitive emissions monitoring.

The cost effectiveness values are determined using the total annualized cost for the emission control, including capital, annual operating and maintenance costs, divided by the resulting emissions reduction.

Pneumatic Controllers

Pneumatic controllers are instruments used for maintaining process conditions such as liquid levels and pressure. These devices utilize natural gas, air, or electricity to provide force to actuate a valve. Pneumatic controllers that utilize gases typically vent to the atmosphere. The rate at which gas is vented to the atmosphere is called a bleed rate. The Division currently requires continuous bleed pneumatic controllers to have a bleed rate of less than or equal to six (6) standard cubic feet per minute (scfm). This matches the requirement for continuous bleed pneumatic controllers in 40 CFR §60.5390 of Subpart OOOO and 40 CFR §60.5390a of Subpart OOOOa.

There are also pneumatic controllers called intermittent vent controllers, which only release gas when they actuate (open or close). Under the 2016 O&G Guidance, the Division included these intermittent vent controllers into the same requirement category as continuous bleed pneumatic controllers, having a bleed rate of less than or equal to six (6) scfm. The Division and O&G operators have found this requirement to be problematic in regards to practical enforceability. This is due to the difficulty in estimating the number of actuations and determining the amount of gas vented to the atmosphere for each specific model of pneumatic device at varying conditions. Therefore, industry proposed that P-BACT for pneumatic controllers include intermittent bleed pneumatic controllers.

In support, Industry provided several studies which included: 1) an Environmental Defense Fund (EDF) study and paper – “Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States: Pneumatic Controller Support Information,” 2) a study conducted by the Oklahoma Independent Petroleum Association – “Pneumatic Controller Emissions from a Sample of 172 Production Facilities,” and 3) a paper from the Journal of Environmental Protection (2017) – “Assessment of Uinta Basin Oil and Natural Gas Well Pad Pneumatic Controller Emissions”.

Based on these studies, the Division determined that:

- A small subset of intermittent controllers account for most of the emissions.
- Failures (controllers stuck open) can be minimized through monitoring and maintenance programs.
- Properly maintained intermittent controllers will typically actuate less frequently over time as production declines.
- On average, properly maintained intermittent controllers will emit less than low bleed (<6 scfm) pneumatic controllers over their lifetime.

As a result, the Division has made the following changes to the O&G Guidance for the SWA, UGRB, and JPAD/NPL areas:

Pneumatic Controllers

New Facilities

Upon FDOP, natural gas-operated pneumatic controllers shall be low bleed, intermittent bleed, or zero bleed controllers or the controller discharge streams shall be routed into a closed loop system.

Modified Facilities

Upon modification, new natural gas-operated pneumatic controllers shall be low, intermittent, or zero bleed controllers or the controller discharge streams shall be routed into a closed loop system.

Within 60 days of modification, existing natural gas-operated pneumatic controllers shall be replaced by or converted to low, intermittent, or zero bleed controllers or the discharge streams of existing natural gas-operated pneumatic controllers shall be routed into a closed loop system.

Modification

Historically, the O&G Guidance has considered the introduction of production streams from new wells or additional wells to be a “modification” of an existing facility, and such a modification would trigger P-BACT requirements. That approach continues in the 2018 version O&G Guidance.

What has changed to the definition of a “Modified Facility” in the 2018 O&G Guidance are the list of activities and a return to an emissions based threshold. In the 2016 O&G Guidance, the Division revised the definition of “Modified Facility” to add examples of activities that could end “grandfathered” status for an existing facility. These activities, included fracturing, acidizing, recompletion, and artificial lift, have been described in previous versions of the Guidance under the definition of “grandfathered” facility. Additionally, the definition of “Modified Facility” in the 2016 O&G Guidance replaced the previous emissions based trigger of “greater than those previously permitted” or “increased potential or actual emissions” with a production rate trigger.

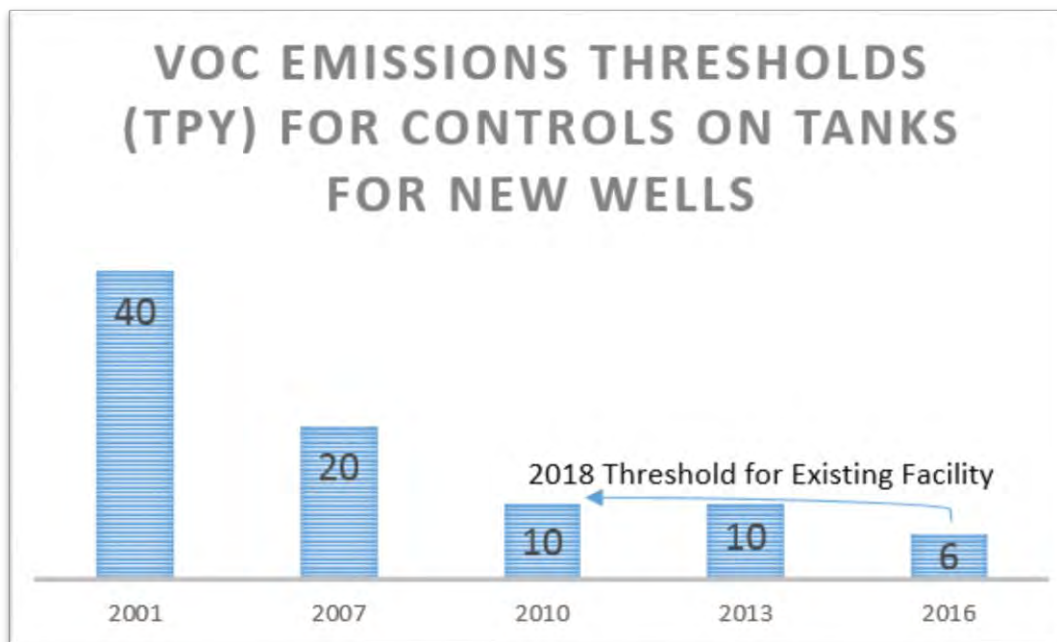
In the 2018 O&G Guidance, the Division removed certain activities from the definition of “Modified Facility” because those activities are not associated with increased emissions. For one, “acidizing” was removed from the list of activities that could trigger a modification. Acidizing is a maintenance activity for a well, and would not stimulate the well or increase emissions. The Division also removed “CO₂ flood/water flood” from the list of activities because this technique is used for heavy oil wells and is not likely to produce significant emissions changes.

The Division also recognized that triggering a modification based on a change in production is inconsistent with the regulatory definition of “modification” found in Chapter 1, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR). The regulatory definition (see below) focuses on emissions. Therefore, in the 2018 O&G Guidance the Division replaced the production rate trigger with a trigger based on emissions.

“Modification” shall mean any physical change in, or change in the method of operation of, an affected facility which increases the amount of any air pollutant (to which any state standards applies) emitted by such facility or which results in the emission of any such air pollutant not previously emitted.

The Division does not establish “permitted” emissions for O&G production sites. Emissions are estimated from early production levels, and those emissions are compared to emission thresholds that trigger the installation of controls. Over the years, the emission thresholds that trigger control installation have become more stringent.

In the 2018 O&G Guidance, the Division established a control installation emission threshold of 10 tons per year of uncontrolled VOC and HAPs emissions from tanks, or 6 tons per year or more of uncontrolled VOC and HAPs emissions from dehydration units, for activities that qualify as potential modifications at existing facilities. These Modified Facility emission threshold levels correspond to the control thresholds for new wells in the 2010 Guidance (see figure below). The Division relied on the 2010 Guidance control thresholds instead of the current (more stringent) thresholds applicable to new facilities because of the generally higher costs to install pollution controls at existing facilities due to existing site configuration changes.



The chosen thresholds for existing facilities also afford operators the flexibility to upgrade an existing facility without triggering a modification as long as the total emissions remain below the established thresholds. Environmental protection is maintained by requiring controls to be installed, or re-installed in cases where the controls have been previously removed, if the thresholds are exceeded. During the decade from 2000 – 2010, the Division issued permits for more than 6,000 production facilities. The emission control thresholds during that decade were higher than those in place today. As an example of how the modification emission threshold applies under the 2018 Guidance, assuming that all of those 6000 production facilities currently operate at the uncontrolled VOC emission threshold of 20 tpy and trigger a modification at the 10 tpy threshold requiring the installation of controls, there would potentially be about 100,000 tons of reductions in VOC emissions.

Under the 2018 Guidance, activities such as increasing the production rate by fracturing, recompletion of a current/additional production zone, or the introduction of artificial lift methods will no longer be considered a modification for facilities that already have emission controls in place. If a modification is triggered by any of these activities at an existing facility that does not have emission controls in place, controls will have to be installed on the tanks and dehydration units. The Division is requiring tanks and dehydration units to be controlled because they have the highest capacity to emit. The Division is not requiring retrofitting controls on other sources at an existing facility because there is generally little environmental benefit for the cost.

Another change to the definition of “Modified Facility” is for the replacement of existing production equipment with larger equipment. Under the 2016 version of the Guidance, that replacement triggered facility-wide P-BACT requirements if the replacement resulted in “increased potential or actual emissions.” Under the 2018 revised definition of “Modified Facility”, the replacement triggers P-BACT control requirements only for the new equipment if the absolute (i.e., total) emissions from tanks or dehydration units equals the threshold levels described earlier of 10 tpy from tanks or 6 tpy from dehydration units. This revised definition provides for greater operator flexibility for making changes to existing facilities, and maintains environmental protection because emission controls are required on the previously uncontrolled sources that have the highest capacity to emit.

The revised definition of “Modified Facility” is as follows:

Modified Facility – An existing facility becomes modified once production streams or production equipment associated with another well or wells is added to or tied into it. The date modification occurs to an existing facility is the First Date of Production for the added well or the date the production streams associated with an additional well or wells are tied into equipment at the existing facility.

Examples of facility modifications not involving new wells or added production from other wells that would require the installation of presumptive BACT controls on **condensate tanks and dehydration units** are:

- Increasing the production rate by fracturing, recompletion of a current production zone or additional production zones, or the introduction of artificial lift methods such that the uncontrolled, total tank emissions (flashing + S/W/B) are greater than or equal to 10 tons per year (TPY) VOC and HAPs or uncontrolled dehydration unit emissions are greater than or equal to 6 TPY VOC and HAPs.

An example of a modification not involving new wells or added production from other wells that would require the installation of limited presumptive BACT controls (limited to the new equipment only) is:

- Existing production equipment is replaced with larger equipment, such that the uncontrolled, total tank emissions (flashing + S/W/B) are greater than or equal to 10 tons per year (TPY) VOC and HAPs or uncontrolled dehydration unit emissions are greater than or equal to 6 TPY VOC and HAPs.

Note 1: When equipment with Presumptive BACT requirements is added to a facility but doesn't trigger the definition of a modified facility, the Presumptive BACT requirements only have to be met for the new equipment (i.e., a pneumatic methanol pump is added, this new pump would have to either be controlled or solar, air or electric).

Note 2: For existing facilities with controls already in place, increasing the production rate by fracturing, recompletion of a current production zone, the introduction of artificial lift methods, or completing in additional production zones would not be considered a modification.*

Note 3: For changes at existing facilities not involving new wells or added production from other wells, operators will be allowed 30 days from the date of the change to evaluate production/emissions, and 60 days from the date of the change to install controls if the change triggered a modification to the facility. For artificial lift, if production data gathered during the 30 days from the date of the change are not satisfactory to the operator, the artificial lift may be removed within 60 days from the date of the change without triggering a modification to the facility.

** to include existing controls on oil/condensate tanks and dehydration units if a facility includes both of these types of emission units, or controls on tanks for facilities with no dehydration units, or controls on dehydration units for facilities with no tanks.*

Fugitive Emissions

As defined in Chapter 1 Section 3 of the WAQSR, “Fugitive Emissions” means those emissions that could not reasonably pass through a stack, chimney vent, or other functionally equivalent opening.

As part of the presumptive BACT analysis, the Division looked to the new source performance standard Subpart OOOOa to determine a baseline or starting point for evaluation of presumptive BACT for fugitive emissions. Subpart OOOOa defines fugitive emission components and establishes a frequency for monitoring these components. The definition of a “fugitive emissions component” is shown below:

“Fugitive emissions component” means any component that has the potential to emit fugitive emissions of VOC at a well site, including but not limited to valves, connectors, pressure relief devices, open-ended lines, flanges, covers and closed vent systems, thief hatches or other openings on a controlled storage vessel, compressors, instruments, and meters. Devices that vent as part of normal operations, such as natural gas-driven pneumatic controllers or natural gas-driven pumps, are not fugitive emissions components, insofar as the natural gas discharged from the device's vent is not considered a fugitive emission. Emissions originating from other than the vent, such as the thief hatch on a controlled storage vessel, would be considered fugitive emissions.

Under Subpart OOOOa. “Fugitive emissions components” are to be monitored on a semi-annual basis utilizing optical gas imaging or Method 21. Subpart OOOOa also goes on to define fugitive emissions as any visible emissions from a fugitive emissions component utilizing optical gas imaging or an instrument reading of 500 parts per million (ppm) or greater using Method 21. Based on this information, the Division requested from the Petroleum Association of Wyoming the cost of a typical optical gas imaging device being utilized by its members along with training and maintenance costs. In addition, the Environmental Defence Fund (EDF) and the Wyoming Outdoor Council (WOC) provided the Division the ICF document – “Economic Analysis of Methane Emission Reduction Opportunities in the U.S. Onshore Oil and Natural Gas Industries”

The cost provided by Petroleum Association of Wyoming (PAW) for an optical gas imaging device was \$110,000 and the training and maintenance costs provided were \$6,250. The costs in the ICF document provided by EDF/WOC for fugitive emissions monitoring was \$191,075 with training costs at \$6,223. The PAW and EDF/WOC costs are comparable to the price that the Division has incurred for providing compliance inspectors with optical gas imaging devices (\$112,000 for an optical gas imaging device and \$11,400 for training and maintenance). Based on the above information the Division calculated the cost to control fugitive emissions. A control efficiency of fifty percent (50%) was attributed to semi-annual monitoring and a control efficiency of sixty percent (60%) was given to quarterly monitoring.

Frequency	Control Efficiency (%)	Uncontrolled VOC emissions (tpy)	Controlled VOC emissions (tpy)	Capital Cost (\$)	Annual Cost (\$)	Capital Recovery Cost (\$)	Total Annual Cost (\$)	Cost to Control (\$/ton)
Industry Provided Costs								
Semi-annual	50	6	3	110,000	6,250	29,018	35,268	11,756
Quarterly	60	6	2.4	110,000	6,250	29,018	35,268	9,797
Division Costs								
Semi-annual	50	6	3	112,000	11,400	29,545	40,945	13,648
Quarterly	60	6	2.4	112,000	11,400	29,545	40,945	11,374
EDF/WOC Costs								
Semi-annual	50	6	3	191,075	6,223	44,825	51,048	17,016
Quarterly	60	6	2.4	191,075	6,223	44,825	51,048	14,180

The above costs do not account for the location of production sites and that they are unmanned facilities. If one accounts for travel costs (as provided by Industry), which are approximately \$15,500 for semi-annual visits and \$20,500 for quarterly visits, the cost to control VOCs rises to \$16,900/ton of VOC controlled (semi-annual) and \$15,500/ton (quarterly). Based on the cost to control VOCs (as shown in the preceding table), the Division considers following the requirements of Subpart OOOOa as being presumptive BACT for fugitive VOC emissions in the Statewide Area, UGRB, and JPAD/NPL. However, it should be noted that the Division is also retaining the presumptive BACT requirement of quarterly fugitive emissions monitoring in the UGRB and JPAD/NPL if fugitive VOC emissions are greater than 4 tpy.