OIL AND GAS PRODUCTION FACILITIES
CHAPTER 6, SECTION 2
PERMITTING GUIDANCE

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

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EFFECTIVE for all wells spudded on/after September 1, 2007 and for all new facilities with First Dates of Production on/after September 1, 2007 and for all modifications to existing facilities occurring on/after September 1, 2007

This document applies to oil and gas production operations where oil and gas fluids are produced, processed and treated prior to lease custody transfer.

Throughout this Guidance, Statewide refers to all O&G Production Facilities other than those located in the Jonah and Pinedale Anticline Development Area defined as:

R109W & R110W in T34N
R109W & R110W in T33N
R108W, R109W & R110W in T32N
R108W, R109W & R110W in T31N
R107W, R108W & R109W in T30N
R107W, R108W & R109W in T29N
R108W & R109W in T28N
R107W, R108W & R109W in T27N

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ACRONYMS & ABBREVIATIONS

BACT	Best Available Control Technology
BTEX	Benzene/Toluene/ethyl-Benzene/Xylenes
C6 S2	Chapter 6 Section 2 (of the WAQSR)
CAA	Clean Air Act Amendments of 1990
EPA	Environmental Protection Agency
H_2S	Hydrogen Sulfide
HAP	Hazardous Air Pollutants
NOI	Notice of Installation
NOV	Notice of Violation
NO_X	Nitrogen Oxides
NESHAP	National Emission Standards for Hazardous Air Pollutants
NSPS	New Source Performance Standards
NSR	New Source Review
PSD	Prevention of Significant Deterioration
SO_2	Sulfur Dioxide
S/W/B	Standing/Working/Breathing losses
TPY	Tons per Year
TEG	Tri-Ethylene Glycol
VOC	Volatile Organic Compounds
WAQSR	Wyoming Air Quality Standards and Regulations

Introduction

The purpose of the Chapter 6 Section 2 Oil and Gas Production Facilities Permitting Guidance (C6 S2 Guidance) document is to serve as a supplement to the **Wyoming Air Quality Standards and Regulations** (**WAQSR**) Chapter 6 Section 2 **New Source Review** (**NSR**) permitting program, as it applies to oil and gas production facilities.

To obtain a copy of the C6 S2 Guidance contact the Wyoming Air Quality Division at:

(307) 777-7391 or (307) 473-3475

The C6 S2 Guidance is also available on our website:

http://deq.state.wy.us/aqd/

Applicability

If **ANY** regulated air contaminant will be released to the atmosphere from a new facility, that facility is subject to **Wyoming Air Quality Standards and Regulations** (**WAQSR**) and the Wyoming Environmental Quality Act.

Regulated air contaminants commonly associated with O&G production facilities are:

Volatile Organic Compounds (**VOC**): These are hydrocarbon compounds excluding methane and ethane. VOC are also referred to as C_3^+ compounds – propane, butane, pentane, hexane, etc.

Hazardous Air Pollutants (**HAP**): Section 112(b) of the Clean Air Act lists 188 hazardous air pollutants. HAPs commonly associated with O&G production are BTEX and n-hexane (benzene, toluene, ethyl-benzene, xylenes and n-C_6).

Nitrogen Oxides (**NO_X**): NO_X emissions are the result of natural gas combustion.

Carbon Monoxide (**CO**): CO emissions are the result of natural gas combustion.

Hydrogen Sulfide (**H_2S**): Sour gas.

Sulfur Dioxide (**SO_2**): SO_2 is formed when sour gas is combusted.

Owners/operators of **ALL** regulated air emission sources constructed or modified after May 29, 1974 must comply with the WAQSR Chapter 6, Section 2 permitting requirements.

Failure to comply with Wyoming air quality regulations may result in an enforcement action in the form of a "Notice of Violation" and penalties of up to $10,000.00 per day.

To obtain a copy of the WAQSR contact the Wyoming Air Quality Division at:

(307) 777-7391

The WAQSR is also found of the Department of Environmental Quality Website:

<http://deq.state.wy.us/>

Wyoming Air Quality Regulation Overview

This is a brief overview of some WAQSR which may impact O&G production operations. This overview is not all inclusive. Other regulations or interpretations not listed here may impact O&G production operations and you should refer to the actual regulations for more complete information.

Chapter 6, Section 2 (C6 S2) Permit Requirements for Construction, Modification and Operation

C6 S2 is Wyoming's **NEW SOURCE REVIEW** regulation, in effect since May 29, 1974. Facilities in operation before this date may have **grandfathered status** and may be exempt from C6 S2 permitting requirements.

C6 S2 applies to virtually every situation where regulated air contaminants are discharged to the atmosphere. If a site, piece of equipment, source, facility, or process, which may cause or increase the emissions of a regulated air contaminant into the atmosphere, is constructed, modified or operated, then it is subject to NSR regulation. The C6 S2 permitting process and its potential impacts on a project should be considered in the early stages of the project development in order to avoid delays.

> **Grandfathered status:** A facility, installation or site which was built or in service before May 29, 1974 that has not been physically or operationally changed, causing an increase in any regulated pollutant (to which any state standard applies) or causing the emission of a new regulated pollutant. Modifications which could eliminate grandfather status are increasing production rate by fracturing, acidizing, recompletion, change in artificial lift method, bringing new wells into a central battery, a waterflood response, installing compression or increasing horsepower.

Chapter 6, Section 3 (C6 S3) Operating Permits

C6 S3 is Wyoming's **OPERATING PERMIT PROGRAM**. C6 S3 permits incorporate requirements of, and ensure compliance with applicable regulations and construction permit conditions for:

- major sources - one that emits or has the potential to emit any of the following:
  100 tons per year (TPY) or more of any regulated air pollutant (NO_X, SO_2, VOC, PM_{10})
  10 TPY or more of any individual Hazardous Air Pollutant (HAP)
  25 TPY or more of any combination of HAP's
- sources subject to New Source Performance Standards (**NSPS**)
- sources subject to National Emission Standards for Hazardous Air Pollutants (**NESHAP**), except that not all sources subject to a NESHAP are required to obtain a C6 S3 operating permit
- sources subject to **acid rain** provisions of the Environmental Quality Act
- sources subject to preconstruction review requirements under Prevention of Significant Deterioration (**PSD**)

All **major** sources are subject to C6 S3 permitting requirements regardless of when the source was constructed or modified. There is no grandfather status provision under C6 S3. Major sources commencing operation after November 15, 1995 have one year after commencing operation to submit the required C6 S3 application, comply with the synthetic minor exemption as provided by C6 S3 or limit emissions to less than major source levels under the conditions of a federally enforceable permit.

Wyoming Air Quality Regulation Overview, cont'd.

Chapter 6, Section 4 (C6 S4) Prevention of Significant Deterioration (PSD)

C6 S4 is applicable to any facility which is considered a "PSD major emitting facility", one that emits or has the potential to emit 250 tons per year (TPY) or more of a regulated air pollutant.

Sources subject to C6 S4 must adhere to specific permit application requirements such as air quality modeling, emissions monitoring and strict use of BACT.

Chapter 5 (C5) National Emissions Standards

C5 incorporates emission control regulations developed by the EPA for specific source categories. These regulations are adopted by the State of Wyoming in order to maintain administrative authority with regard to the standards.

Chapter 5, Section 2 (C5 S2) New Source Performance Standards (NSPS)

This section contains performance standards for criteria pollutant emissions from specific categories of new sources. NSPS which may be applicable to O&G production facilities are **40 CFR part 60, Subparts K, K_a and K_b** for Storage Vessels for Petroleum Liquids, depending on when a storage vessel was constructed, reconstructed or modified and what is stored in the vessel.

Chapter 5, Section 3 (C5 S3) National Emission Standards for Hazardous Air Pollutants (NESHAP)

This section contains emission standards regulating specific categories of stationary sources that emit, or have the potential to emit, one or more of the hazardous air pollutants listed pursuant to section 112(b) of the Clean Air Act Amendments of 1990.

A NESHAP applicable to O&G production facilities is 40 CFR part 63, Subpart HH, promulgated June 17, 1999. The rule targets O&G production facilities which are **major** sources of HAP, with major defined as 10 TPY or more of any single HAP or 25 TPY or more of any combination of HAP.

Final action under Subpart HH with respect to O&G production **area** source facilities was deferred until **December 21, 2006.** The final rule, **effective January 3, 2007**, affects **area** source oil and natural gas production facilities.

Wyoming Air Quality Regulation Overview, cont'd.

The following is for informational purposes only to help operators understand the new NESHAP affecting O&G area source production facilities, Subpart HH. Until this rule is adopted by the State of Wyoming, EPA maintains administrative authority with regard to the standards.

The final rule, **effective January 3, 2007**, affects area source oil and natural gas production facilities.

> **Area source:** stationary source that emits or has the potential to emit, considering controls, less than 10 TPY of any single HAP and less than 25 TPY of any combination of HAP.
>
> **Oil and natural gas production facility**: one that processes, upgrades or stores (1) hydrocarbon liquids (except those that exclusively handle black oil) to the point of custody transfer and (2) natural gas from the well up to and including the natural gas processing plant.
>
> **Black oil**: hydrocarbon (petroleum) liquid with an initial producing gas-to-oil ratio (GOR) less than 1,750 SCF/bbl and an API gravity less than 40 degrees.
>
> **Affected source:** each TEG dehydration unit located at an area source oil and natural gas production facility with an actual annual average natural gas flow rate equal to or greater than 3.0 MMSCFD **and** with benzene emissions equal to or greater than 1.0 ton per year.

Requirements for affected sources vary, depending upon one of two locations with regard to areas of higher population densities:

1) areas inside UA plus offset and UC boundaries
2) areas outside UA plus offset and UC boundaries

These boundaries are described on the Internet site at http://www.epa.gov/ttn/atw/oilgas/oilgaspg.html, or you can generate a map based on the location of a TEG dehydration unit relative to UA plus offset and UC boundaries at http://factfinder.census.gov.

For affected sources located inside the UA plus offset and UC boundaries, those units must: (1) be connected, through a closed vent system, to one or more emission control devices to reduce HAP emissions by 95% or more, (2) reduce HAP emissions to an outlet concentration of 20 parts per million by volume (PPMV) or less or (3) reduce benzene emissions to a level less than 1.0 TPY.

For affected sources located outside the UA plus offset and UC boundaries, those units must reduce emissions by lowering the glycol circulation rate to be less than or equal to an optimum rate determined by the following equation:

$$L_{OPT} = 1.15 * [3.0 \text{ gallons TEG / lb } H_2O] * [F * (I-O)/24 \text{ hr/day}]$$

Where:
L_{OPT} = optimal circulation rate (gal/hr)
F = gas flowrate (MMSCFD)
I = inlet water content (lb/MMSCFD)
O = outlet water content (lb/MMSCF)

Wyoming Air Quality Regulation Overview, cont'd.

Natural gas flowrates of a TEG dehydration unit must be determined using either a flow measurement device or another method approved by the Administrator.

To demonstrate the unit emits less than 1.0 TPY of benzene, emissions must be determined using either GRI-GLYCalc V3.0 or higher or direct measurement.

For affected units located within the UA plus offset and UC boundaries, the source must submit Notification of Compliance Status Reports, inspect/test the closed-vent system and control device(s) and establish monitoring parameter values. Notifications are to be submitted to the EPA with a copy forwarded to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25th Street, Cheyenne, WY 82002.

For affected units located outside the UA plus offset and UC boundaries, the source only has to submit an Initial Notification which must include a certified statement of future compliance. Notifications are to be submitted to the EPA with a copy forwarded to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25th Street, Cheyenne, WY 82002.

Affected units located within the UA plus offset and UC boundaries are required to submit periodic reports, perform annual inspections of closed-vent systems, repair leaks and defects, conduct required monitoring and maintain records.

Affected units located outside the UA plus offset and UC boundaries must maintain a record of the glycol circulation rate determination.

Compliance deadlines vary depending on location and start up of the affected unit. The soonest compliance date is January 3, 2007 for certain new sources. After that, the next compliance date is January 5, 2009 for certain existing sources.

Operators of TEG dehydration units are encouraged to review the final rule which can be downloaded from the internet at http://www.epa.gov/ttn/oarpg/t3/fr_notices/ongfinalrule122106.pdf.

Wyoming Air Quality Regulation Overview, cont'd.

Chapter 2, Section 7 (C2 S7) Hydrogen Sulfide

C2 S7 is the State ambient air standard for hydrogen sulfide (H_2S). In order to comply with this regulation controls may be required to ensure ambient sulfur dioxide or H_2S standards are not exceeded.

As a minimum the Division prefers that process gas streams containing H_2S be flared instead of discharging to atmosphere.

Caution: Flaring H_2S creates Sulfur Dioxide (SO_2), a regulated pollutant, and is likely to result in other control and permitting requirements.

Operators wanting to construct new O&G production facilities which will have associated H_2S or SO_2 emissions should contact division staff prior to construction of such facilities for permitting guidance.

Chapter 3, Section 6 (C3 S6) Volatile Organic Compounds

C6 S3 refers to the definition of "volatile organic compounds", specifies that BACT shall be applied to limit VOC emissions, defines "smokeless" operation of flares and specifies a 20% opacity limit for flares used to control VOC emissions from various activities, including those generated during certain oil and gas development, production and processing operations.

C6 S2 O&G Production Facilities Permitting Program

Why and How the Program Works

C6 S2 requires all new or modified sources or facilities which may generate regulated air emissions to obtain a construction permit prior to start up/modification and that **Best Available Control Technology (BACT)** be applied to reduce or eliminate emissions from a facility with consideration given for technical feasibility and economical reasonableness. **BACT** is a process, not an emission limit. Regulation does not set a minimum emission threshold below which **BACT** does not need to be considered.

Generally, emissions associated with production equipment and processes at new or modified O&G production facilities can not be determined until after start up/modification. To accommodate this, the AQD has tailored a permitting program specific to O&G production operations, allowing start up or modification to occur prior to obtaining a construction permit, provided the operators of such facilities meet certain emission control requirements which have been established through the BACT process. This permitting process for O&G production facilities is called **Presumptive BACT.**

Presumptive BACT requirements have been established for flashing emissions, emissions from dehydration units, emissions from certain pneumatic equipment and emissions associated with well completion operations in specific areas of the State. **BACT** for emissions associated with other processes and equipment may be evaluated on a case by case basis.

For O&G production facilities where emissions from proposed equipment **are** known prior to construction or modification, the C6 S2 permit must be obtained **PRIOR TO CONSTRUCTION or MODIFICATION** and **BACT** must be considered at the time of application review. Examples of O&G production facilities where emissions are known prior to construction or modification are a central tank battery designed for collecting and processing production from multiple existing oil wells, a central dehydration unit installation for drying gas from multiple existing gas wells or perhaps a single dehydration unit for processing gas from one existing well.

In this guidance, the C6 S2 O&G Production Facilities permitting process is divided into two sections. One section applies to O&G production facilities located within the **JONAH AND PINEDALE ANTICLINE DEVELOPMENT (JPAD) AREA.** The other applies to all other **STATEWIDE** areas.

The **JPAD** area is legally defined as:

R109W & R110W in T34N
R109W & R110W in T33N
R108W, R109W & R110W in T32N
R108W, R109W & R110W in T31N
R107W, R108W & R109W in T30N
R107W, R108W & R109W in T29N
R108W & R109W in T28N
R107W, R108W & R109W in T27N

C6 S2 O&G Production Facilities Permitting Program

Regulated Air Pollutant Sources, Equipment & Processes at O&G Production Facilities

When permitting an O&G production facility all emission sources must be considered. Generally the three most significant sources of regulated air pollutants are:

1) Hydrocarbon Liquid Storage Tanks: Vapors containing regulated pollutants are released from solution in hydrocarbon liquids as the liquids are transferred from higher to lower pressure, such as from a separator to an atmospheric storage tank. These vapors are called **flashing losses**.

Vapors escaping from hydrocarbon liquids while they are stored in atmospheric tanks are called **standing/working/breathing (S/W/B) losses**. Standing losses are essentially evaporation losses. Working losses are those caused by decreased tank vapor space occurring as the tank is filled. Breathing losses are those promoted by ambient changes such as increased air temperatures.

2) Dehydration Units: Glycol, usually tri-ethylene glycol (TEG), is used in dehydration units to absorb water from wet produced gas. "Lean" TEG contacts the wet gas and absorbs water. The TEG is then considered "rich". As the rich TEG is passed through a flash separator and/or reboiler for regeneration, steam and hydrocarbon vapors are released from it. These are then vented from the dehydration unit flash separator and/or reboiler still vent.

3) Pressurized Process Vessels: Vents on separators, treaters, water knockouts, gas boots, drip pots, etc. release hydrocarbon vapors containing regulated pollutants. Unless these vents are not tied into a sales line or other closed loop collection system, they are emission points for regulated air pollutants. Sometimes there are several pressurized vessels operating in series, such as a 2-phase HP separator dumping into a 3-phase LP separator. In this case, in addition to the flash that occurs from the separator to the storage tanks, flashing losses occur as fluids dump from the 2-phase to the 3-phase vessel. All vents from these units must be considered when determining which are emission sources.

Less significant sources are:

Gun Barrels: Regulated air pollutants are associated with the natural gas released form these types of separation tanks.

Natural Gas-Fired Combustion Units: Some of the byproducts of natural gas combustion in process heaters, boilers, burners, flares, engines, etc. are regulated air pollutants.

Fugitives: Fugitive emissions are those associated with equipment and process component leaks. There are always leaks, no matter how minimal, from pipe connectors, flanges, fittings, gaskets, pump packing, hammer unions, tank hatches, pneumatic controllers, etc.

Pneumatic Pumps: Usually the motive gas used to operate pneumatic pumps is vented from the pumps. If the motive gas is natural gas, it probably contains regulated air pollutants.

Truck Loading: When oil and condensate are loaded into tank trucks the hydrocarbon vapors released from the tanker lines as the truck is filling contain regulated air pollutants.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT Process

STATEWIDE

THE FIRST STEP

There are two steps to the C6 S2 Presumptive BACT permit application process for O&G production facilities. Applying Presumptive BACT is the first step. Filing a complete C6 S2 application is the second step.

Presumptive BACT requirements must be considered for

1) dehydration unit emissions and
2) storage tanks and pressurized vessels with flashing emissions.

Dehydration unit emissions

Dehydration units use glycol (TEG, DEG or EG) to absorb water from produced gas before it is introduced into gas sales or collection lines. Upon contact with wet gas, "lean" glycol absorbs water and other liquids. It is then considered "rich". To remove impurities, or regenerate, the rich glycol is routed through a glycol flash separator and/or a reboiler. During flash separation and reboiling, water and hydrocarbon vapors containing VOC and HAP pollutants are released from the rich glycol. These are then discharged to the atmosphere from the dehydration unit process vents.

How are dehydration unit VOC and HAP emissions determined for the Presumptive BACT process?

STEP 1: Within 30-days after the First Date of Production or modification calculate the **average daily gas production**.

Example:
Well produced 100 MMCF during the first 30-days after the First Date of Production
average daily gas production = 100 MMCF ÷ 30 days = 3.3 MMCFD

STEP 2: Calculate the **projected first year average daily gas production** rate by multiplying the initial average 30-day rate times 0.6. This effectively results in determining a first year, average daily gas production rate which is 80% less than the initial production rate. In other words, the well's initial production is projected to decline by 80% by the end of the first year of operation. First year, projected emissions are then calculated using this decline, average, daily rate for the first year of operation. See page 47 for greater explanation.

Example:
projected first year average daily gas production = 3.3 MMCFD × 0.6 = 2.0 MMCFD

STEP 3: Use GRI-GLYCalc V3.0 or higher to determine **potential uncontrolled VOC and HAP emissions** from the **process vents** of the dehydration unit associated with the projected first year average daily gas production rate. **Process vents** include reboiler still vents, glycol flash separators and still vent condensers.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT Process

STATEWIDE

THE FIRST STEP

NO_X and CO emissions associated with emission control combustion devices are to be calculated using the volumes of waste gas from the process vents, as predicted by the GLYCalc model, and the AP-42 flare emission factors listed in this guidance.

Input to the GLYCalc model must include:

1) An extended hydrocarbon analysis of wet gas sampled upstream of the reboiler contact tower. Or, a composite extended hydrocarbon analysis may be used. The composite analysis must be the average wet gas composition from at least five nearby wells producing from the same formation as the new well and under the same or very similar pressure and temperature conditions. The five samples used for the composite must be no older than three years.
2) The projected first year average daily gas production rate (MMCFD).
3) Average operational parameters, including wet gas temperature and pressure, dry gas water content, glycol flash separator temperature and pressure, stripping gas source and rate and average operating parameters of emission control equipment.
4) The **maximum lean glycol circulation rate** (gpm) for the glycol circulation pump in use. Maximum circulation rates for the most commonly used Kimray Model pumps are listed in **TABLE 1**. If different pump makes are used, contact the manufacturer for the maximum rates.

TABLE 1

KIMRAY GLYCOL PUMP RATES

Model #	Capacity (gpm)		Working Pressure (psi)	
	min	max	min	max
3154 PV	0.05	0.22	100	1500
1715 PV	0.13	0.67	300	1500
4015 PV	0.2	0.67	300	1500
9015 PV	0.45	1.5	300	1500
21015 PV	1.1	3.5	400	1500
45015 PV	2.77	7.5	400	1500
4015 LP	0.13	0.33	100	500
2015 SC	0.13	0.33	100	500
5015 SC	0.2	0.83	100	500
10015 SC	0.37	1.67	100	500
20015 SC	1	3.33	100	500

Manufacturer data from Kimray - 1983

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT Process

STATEWIDE

When do dehydration unit VOC and HAP emissions require control?

If projected, first year emissions thresholds will be met or exceeded, dehydration unit process vents must be controlled according to BACT requirements **within 60-days** of the First Date of Production and prior to the emission of major source levels of any regulated air pollutants. The thresholds, rounded to the nearest 0.1 ton, are:

≥ 5.0 TPY of any combination of HAPs, or ≥ 15.0 TPY any combination of VOCs

REMINDER: If actual throughput to the unit is ≥ 3.0 MMCFD **and** actual benzene emissions from the unit are ≥ 1.0 TPY, the unit is an affected unit under the new NESHAP for O&G area source production facilities, Subpart HH. It is the operator's responsibility to comply with requirements of the rule.

CAUTION: Total emissions from any facility or source must not exceed major source levels prior to emission control installation. Major source levels are 10 TPY of any single HAP, 25 TPY of any combination of HAP or 100 TPY of any regulated pollutant. Dehydration unit emissions occurring prior to the installation of required controls will be determined using the GRI-GLYCalc model based on the maximum lean glycol circulation rate, the reported gas production rate including that reported during well completion operations and other actual operating parameters.

CAUTION: Emissions may ultimately exceed the projected levels rather than decline according to projections. Operators should be mindful of this since emission controls will be required through permitting if the controllable Presumptive BACT levels are exceeded. Compliance actions may be taken when these levels are exceeded.

What are Presumptive BACT requirements for dehydration unit VOC and HAP emissions?

The following control systems or devices are considered by the Division as meeting BACT for emissions from dehydration unit process vents (reboiler still vents and vents from glycol flash separators or glycol flash tanks):

1) Vapor recovery device (e.g. condenser, BTEX control system) that is designed and operated and may be demonstrated to reduce the mass content of total HAP and VOC in the process gases vented to the device by at least 98% by weight.
2) Enclosed smokeless combustion device or smokeless flare that is designed and operated and may be demonstrated to reduce the mass content of total HAP and VOC in the process vapors vented to the device by at least 98% by weight.
3) Any other control device or configuration that can be demonstrated to reduce the mass content of total HAP and VOC in the process gases vented to the device or configuration by at least 98% by weight.

Emissions control equipment, systems or devices, all vent lines, connections, fitting, valves, relief valves, hatches or any other appurtenance employed to contain and collect vapors and transport them to the emission control system or device, must be maintained and operated during any time a well is producing such that the emissions are controlled at all times.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT Process

STATEWIDE

When projected, uncontrolled emissions exceed major source levels, monitoring and recordkeeping demonstrating continuous and effective emission control are required upon start up of the control system. For combustion devices this may be a thermocouple and continuous recording device for the pilot flame or any other equivalent device to detect and record the presence of the pilot flame. A temperature recorder/monitor might be used to demonstrate sufficient heat of combustion or a continuous, wind-up chart recorder might be used to demonstrate continual operation by measuring and recording temperature or pressure parameters.

Storage tanks and pressurized vessels with flashing emissions

As produced liquids are exposed to temperature and pressure changes (i.e., liquids at separator pressure & temperature are dumped to atmospheric storage tanks or condensate is dumped from a HP to a LP separator), gas entrained in the liquids is released from solution. For purposes of this guidance, the term "**flashing emissions**" refers to the VOC and HAP pollutants associated with vapors released to the atmosphere from hydrocarbon liquids storage tanks and with vapors released to the atmosphere from pressurized process vessels during times other than emergency or upset conditions (i.e., HP separator to LP separator flash gas not collected for sales) and with standing/working/breathing (S/W/B) losses. S/W/B losses refers to vapors displaced from hydrocarbon storage tanks during filling and to vapors displaced from tanks during expansion and contraction of the tank vapor space, caused by changing ambient conditions.

How are flashing emissions determined for the Presumptive BACT process?

STEP 1: 30-days after the First Date of Production calculate the **average daily condensate or oil production**.

Example:
Well produced 600 BPD during the first 30-days after the First Date of Production.
average daily condensate/oil production = 600 BPD ÷ 30 = 20 BPD

STEP 2: Calculate the **projected first year average daily condensate/oil production** rate by multiplying the average daily rate times 0.6. This equates to an 80% decline in condensate/oil production from the well during the first year of production. If the expected decline rate is less than 80%, then the expected decline rate should be used. Using an expected decline rate > 80% requires pre-approval from the Division.

Example:
projected first year average daily production = 20 BPD × 0.6 = 12 BPD

STEP 3: Use an approved flashing emissions model or actual measurements to determine **projected first year VOC and HAP emissions associated with the projected first year average daily production rate**.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT Process

STATEWIDE

THE FIRST STEP

Flashing emission models generally require:

1) an extended hydrocarbon analysis of pressurized condensate/oil sampled at the outlet of the separator or treater and upstream of the atmospheric storage tanks, at the operating conditions of the separator or treater. In other words, the sample should be that of "unflashed" condensate/oil. Or, a composite extended hydrocarbon analysis may be used. The composite analysis must be the average condensate/oil composition from at least five nearby wells producing from the same formation as the new well and under the same, or very similar, pressure and temperature conditions. The five samples as the basis for the composite must be no older than three years.
2) the actual operational parameters of the separation and storage equipment

Some commonly used flashing models are API E&P TANK V2, Prosim, Hysim, Hysys, ProMax, KFlash. All are simulation software based on known properties of hydrocarbon liquids and vapors and accepted chemical equations of state. Using a known composition of hydrocarbon liquids at certain conditions, the models predict the volumes and compositions of vapors that will be released from that liquid as it is exposed to changing temperatures and pressures.

Sometimes it is not possible to get an extended hydrocarbon analysis of heavier crudes due to properties of the crude. When this is the case the Vasquez-Beggs GOR (VB) correlation may be used to estimate flashing emissions from hydrocarbon storage tanks. The correlation is basically intended to be used as an indicator of relative volumes of vapors which might be released from stored crudes and should not be used when the API gravity of the crude exceeds 35 degrees since the accuracy of the correlation decreases with increased gravity. Contact the Division for an excel copy of the VB correlation or it may be downloaded from the AQD website at http://deq.state.wy.us/aqd/sec21/bflash.xls

Flashing emissions, especially those from pressurized vessels, may also be determined through direct measurement and analysis of the vapors. This requires careful isolation of the flash vessel so that the only route of vapor release is through a calibrated meter.

Alternate methods for determining flash emissions must receive prior approval from the Division.

When do flashing emissions require control?

When projected, uncontrolled emissions associated with flashing, rounded to the nearest 0.1 ton, are ≥**20 TPY VOC**, flashing emissions must be controlled according to BACT requirements **within 60-days** of the First Date of Production and prior to the emission of major source levels of any regulated air pollutants.

CAUTION: Total emissions from any facility or source must not exceed major source levels prior to emission control installation. Major source levels are 10 TPY of any single HAP, 25 TPY of any combination of HAP or 100 TPY of any regulated pollutant. Flashing emissions prior to control installation will be determined using approved emission models or methods based on actual reported production and operating conditions. Reported production includes that sold during well completion activities which are reported to the WOGCC. Flashing emissions are directly proportional to production

C6 S2 O&G Production Facilities Permitting Program

rates, provided operational parameters remain consistent, so it is acceptable to prorate emissions based on production.

CAUTION: Emissions may ultimately exceed the projected levels rather than decline according to projections. Operators should be mindful of this since emission controls will be required through permitting if the controllable levels are exceeded. Compliance actions may be taken when emissions thresholds are exceeded.

What are Presumptive BACT requirements for flashing emissions?

The following control systems or devices are accepted by the Division as meeting BACT for flashing emissions:

1) A vapor recovery device that is designed and operated and may be demonstrated to reduce the mass content of VOC and total HAP emissions in the vapors vented to the device by at least 98% by weight.
2) An enclosed, smokeless combustion device or flare that is designed and operated and may be demonstrated to reduce the mass content of VOC and total HAP emissions in the vapors vented to the device by at least 98% by weight.
3) Any other control device or configuration that can be demonstrated to reduce the mass content of total HAP and VOC in the process gases vented to the device or configuration by at least 98% by weight.

Emissions control equipment, systems or devices, all vent lines, connections, fitting, valves, relief valves, hatches or any other appurtenance employed to contain and collect vapors and transport them to the emission control system or device, must be maintained and operated during any time a well is producing such that the emissions are controlled at all times.

When projected, uncontrolled emissions exceed major source levels, the Division requires continuous monitoring and recording of emission control components in order demonstrate continual operation and effectiveness. For a combustion device this may be a thermocouple and continuous recording device or any other equivalent device to detect and record the presence of the pilot flame, or a combustion chamber temperature recorder/monitor. The monitoring/recording requirements become enforceable permit conditions.

Usually, flashing emissions controls may be removed after one year of operation provided VOC flashing emissions have declined to less than 15 TPY. This provision will be included in the final permit, when applicable.

C6 S2 O&G Production Facilities Permitting Program

C6 S2 Application

Unless a permit is required prior to construction, the C6 S2 application is the second step in the Presumptive BACT permitting process. It is an application for a permit to construct a new facility or to modify an existing one.

The C6 S2 application must be **FILED WITHIN 90-DAYS of the FIRST DATE of PRODUCTION** after construction or modification. The application notifies the AQD that the new or modified facility has begun operation. It describes the current process, equipment and associated emissions and serves as a form of certification by the owner that the Presumptive BACT requirements have been met.

Whether the application is being filed after construction under the Presumptive BACT process or prior to construction, the appropriate application forms depend upon the facility equipment and operating scenario. A complete application includes the following applicable forms:

- **A cover letter stating the purpose of the application**

- **A process description and process diagram for the facility including each air emission source and the operational parameters of each source** (see examples on pages 18 & 19)

- **The appropriate application forms**

  AQD-OG0 Identification of application type (application or NOI = application)
  AQD-OG00 Completeness checklist
  AQD-OG1 Application Cover Sheet and the appropriate form for each source:
  AQD-OG2 Reciprocating Engine
  AQD-OG3 Glycol Dehydration Unit
  AQD-OG4 Storage Tanks and Other VOC Emission Sources at **Wellsite Facilities**
  AQD-OG4a Storage Tanks and Other VOC emission sources at **Centralized Tank Batteries**
  AQD-OG5 Flares/Combustion Control Devices and other Fuel Burning Equipment
  AQD-OG6 Pollutant Emission Summary for all Pollutants (uncontrolled and controlled)
  AQD-OG10 BACT cost analysis

- Explanations or demonstrations of all methods used to calculate or estimate emissions for each emission source, including controlled and uncontrolled sources. Emission calculation methods are described later.

- All applicable and required attachments noted on the forms, including

  Input and output for emission models/software/process simulations

C6 S2 O&G Production Facilities Permitting Program

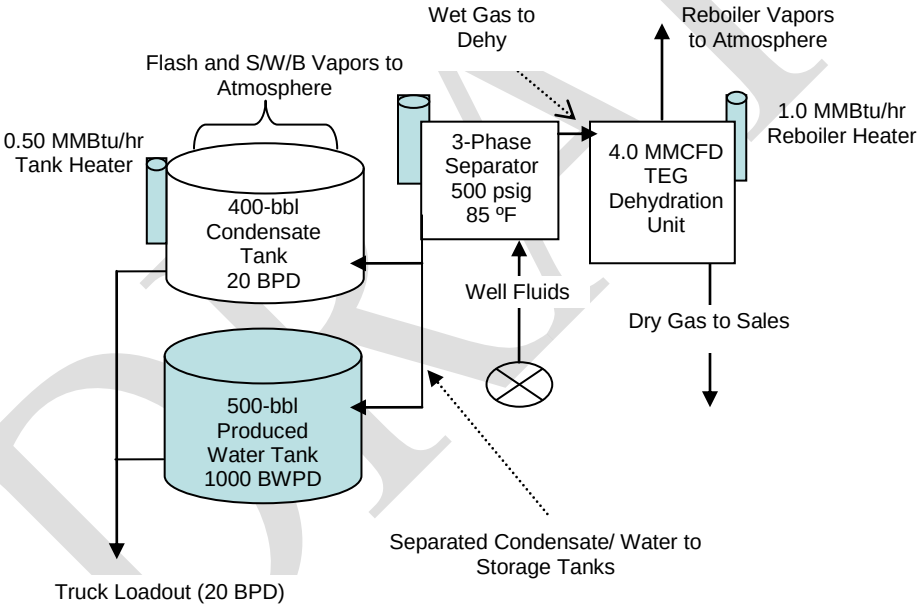
THE SECOND STEP

Equipment manufacturer's emissions information

Laboratory analyses used for emission models/software/process simulations or calculations including a description of sampling procedures and handling, sampling locations, sampling location parameters (i.e., pressure and temperature at sampling port)

- Any additional attachments or information necessary for complete review of the application

Example Process Diagram and Description



EXAMPLE: Air emission sources in the diagram are the condensate storage tank from which vapors are vented to the atmosphere, the dehydration unit reboiler still vent and the three natural gas-fired process heaters. Produced fluids are directed to the 3-phase separator for separation of condensate/water/gas. Wet gas is directed to the TEG dehydration unit for drying. Separated condensate and water are routed to the appropriate tanks for storage prior to being hauled from location via truck. Produced gas is used as burner fuel. Reboiler vapors and flash emissions are vented to the atmosphere along with S/W/B losses from the condensate tank.

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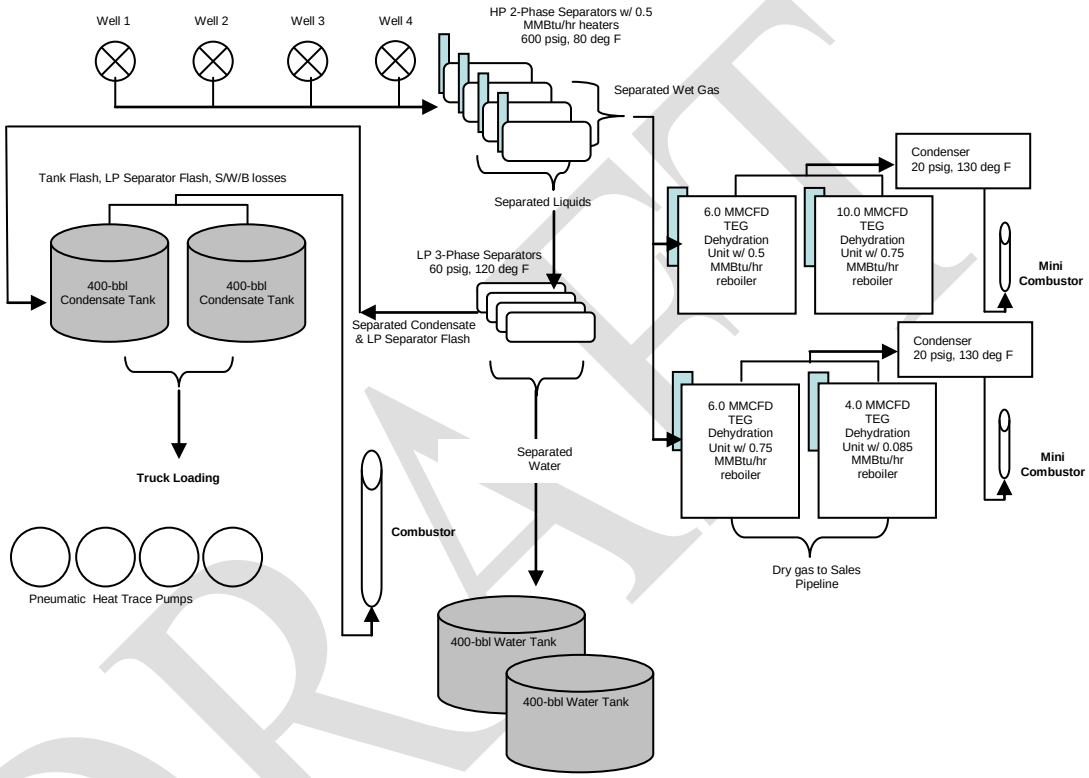
C6 S2 Permit Application Process

STATEWIDE

THE SECOND STEP

Example Process Diagram & Description



EXAMPLE: Total well fluids from four wells flow to the 2-ph HP separators. Wet gas from the HP separators flows to the four dehydration units. Separated fluids from the 2-ph HP separators flows to the 3-ph LP separators. Separated condensate and water flows from the 3-ph LP separators to the storage tanks. Gas released in the 3-ph separators is routed to the condensate storage tanks. Tank vapors, including tank flash, gas from the 3-ph LP separators and S/W/B vapors are collected and directed to a 30-foot smokeless combustor. The temperature of the combustor is continually monitored and recorded using a SCADA system. Reboiler still vent vapors flow through condensers. Condensed liquids are pumped to the condensate storage tanks. Non-condensible vapors flow to the 20-foot Mini-Combustors. The temperature of the Mini-combustors is continually monitored and recorded using a SCADA system. Pneumatic heat trace pumps operate 6 months per year using produced gas from the HP separators to operate. Vent lines from the pumps are routed into the condensate dump lines from the LP separators.

The process diagram does not need to be computer generated. A simple hand sketch will work as long as the required information is included. The diagram does not need to be drawn to scale and does not need to represent the exact position of production equipment at the facility as long as the process description and operating scenario are clearly defined.

C6 S2 O&G Production Facilities Permitting Program

Emissions reported in the application must be based on current average production rates at the time of application filing. Higher production rates may be used if the applicant wants to allow for expected production increases.

For facilities requiring a permit prior to start up of operations, emissions reported in the application must be based on expected production rates. Higher production rates may be used if the applicant wants to allow for production increases.

Both controlled and uncontrolled emissions must be reported in the application.

How are dehydration unit emissions determined for the C6 S2 application?

Use GRI-GLYCalc V3.0 or higher to determine **potential uncontrolled and controlled VOC and HAP emissions** from the dehydration unit process vents. Process vents include reboiler still vents and glycol flash separators.

Potential uncontrolled and controlled VOC and HAP emissions are based on the maximum lean glycol circulation rate for the glycol circulation pump in use (see **TABLE 1** on page 12), appropriate daily dry gas production rate (discussed above), an extended hydrocarbon analysis of the wet gas from a sample taken upstream of the dehydration unit contact tower or an average of five wet gas analyses sampled upstream of the dehydration unit contact towers at surrounding wells producing from the same formation and under very similar conditions, average operational parameters including wet gas temperature and pressure, dry gas water content, glycol flash separator temperature and pressure and stripping gas source and rate, if applicable.

When do dehydration unit emissions require control?

If potential uncontrolled emissions as determined under the Presumptive BACT process were:

≥ 5.0 TPY of any combination of HAP, or
≥ 15.0 TPY any combination of VOC, or

Then, dehydration unit emissions should already have been controlled within 60-days of FDP.

If dehydration unit emissions did not require control under the Presumptive BACT process, but did not decline as projected and now exceed the 5 TPY/10 TPY thresholds at the time of application filing, controls meeting BACT requirements described earlier must be installed. The applicant must identify the date controls were or will be installed in the application.

For facilities requiring permitting prior to startup, the same emission thresholds listed above apply for determining whether or not controls will be required in order to meet BACT requirements.

C6 S2 O&G Production Facilities Permitting Program

C6 S2 Permit Application Process

STATEWIDE

THE SECOND STEP

How are VOC and HAP flashing emissions determined for the C6 S2 application?

Use an approved emissions model, process simulator or actual measurements to determine **uncontrolled VOC and HAP emissions** associated with flashing vapors from hydrocarbon storage tanks and from any pressurized vessels which vent to the atmosphere during times other than upset or emergency conditions.

Uncontrolled VOC and HAP emissions should be based on the appropriate average daily production rates (discussed above), appropriate extended hydrocarbon lab analyses of produced condensate or oil and actual operating parameters of production vessels. **Controlled emissions** depend upon the emission control device or system used or proposed.

When do flashing emissions require control?

If potential uncontrolled flashing emissions determined under the Presumptive BACT process were:

≥ 20 TPY of any combination of VOCs

Then, flashing emissions should already have been controlled within 60-days of FDP.

If flashing emissions did not require control under the Presumptive BACT process, but did not decline as projected and now exceed the 20 TPY threshold at the time of application filing, controls meeting BACT requirements described earlier must be installed. The applicant must identify the date controls were or will be installed in the application.

For facilities requiring permitting prior to startup, the same emission threshold listed above applies for determining whether or not controls will be required in order to meet BACT requirements.

How are emissions from other sources determined?

Calculation methods for other sources such as pneumatic pumps, truck loading, fugitives, natural gas-fired burners, etc. are described in Appendix #.

How is BACT addressed for equipment other than dehydration units and flashing sources?

BACT must be considered for:

sources with ≥ 15 TPY VOC emissions,

sources with ≥ 5 TPY total HAP emissions and

pumping unit engines ≥ 50 HP OR with ≥ 5 TPY NO_X emissions.

C6 S2 O&G Production Facilities Permitting Program

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EITHER the emission source will be controlled using BACT **OR** a BACT cost analysis will be performed and submitted with the application showing either:

control is not technically feasible (i.e., due to physical constraints the emissions can not be controlled)

OR

control is not economically reasonable (i.e., based on a control cost analysis the "cost to control per ton of pollutant reduced" is uneconomical).

CAUTION: **BACT** may be required at lower levels and for other emissions and emission sources than those stated in this guidance, but as a minimum, **BACT** must be considered when equal to or above these guidance emission levels.

Multiple pieces of the same type of equipment are considered one emission source for permitting purposes. For example, if there are five pneumatic heat trace pumps at a facility, emissions from the five pumps are aggregated for permitting purposes. If emissions from one of the heat trace pumps are 10 TPY VOCs and 4 TPY total HAPs, BACT is considered no control. If total emissions from the five heat trace pumps are determined to be 6 TPY total HAPs, the applicant must either control the emissions all five pumps using BACT or demonstrate that doing so is not economically reasonable or technically feasible.

C6 S2 O&G Production Facilities Permitting Program

C6 S2 Permit Application Process

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How to obtain C6 S2 application forms:

Download electronic forms from the AQD website

http://deq.state.wy.us/aqd/oilgas.asp

Contact the Wyoming Air Quality Division at **(307) 777-7391 or (307) 473-3475**

Make written request to

Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002
attn: O&G NSR Permitting

or

Wyoming Department of Environmental Quality
Air Quality Division
152 North Durbin Street, Suite 100
Casper, WY 82601
attn: O&G NSR Permitting

When/where to file a C6 S2 permit application

For facilities where emissions are known prior to construction submit **EITHER** 3 paper copies (one w/ original signature) **OR** 1 paper copy w/ original signature and 1 electronic copy of the complete C6 S2 application PRIOR to construction to the address below.

For facilities constructed or modified under the Presumptive BACT process submit **EITHER** 3 paper copies (one w/ original signature) **OR** 1 paper copy w/ original signature and 1 electronic copy of the complete C6 S2 application within **90-days** of the **First Date of Production** to the address below.

NSR Program Manager / attn: O&G Production Facilities
Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002

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Upon receiving the application, the AQD sends a receipt letter to the applicant. The application is logged into the AQD tracking system and assigned a reviewing engineer. The engineer has up to 30-days to perform a completeness review to ensure adequate and correct information has been filed. If the application is deemed incomplete the engineer will notify the applicant and request further information. Upon completeness the engineer has 60-days to complete a technical review, write an application analysis and make any recommendations. During this process the decision to issue a permit or waiver takes place. If the decision is to issue a permit, the proposed permit, including compliance requirements, is published for a mandatory 30-day public comment period. If no comments are received the permit is issued once the public comment period ends. If comments are received these are addressed by the AQD. It is possible comments will warrant a public hearing. When this is the case, a final permit may be denied or delayed.

An hourly fee will be assessed for the time it takes AQD personnel to process the application. A bill will be sent to the applicant when the process is complete. Billing is handled as follows:

> **Initial billing** is assessed when a proposed permit is sent to public notice. Initial billing must be paid prior to issuance of the final permit.
>
> **Final billing** is assessed for waivers and permits after these are issued.

Contact the Division for the current hourly rate.

C6 S2 O&G Production Facilities Permitting Program

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NOTE: **The Presumptive BACT permitting process may not be used for sour gas (H_2S) production facilities unless the only emissions of H_2S will be those associated with fugitive losses from valves, fittings, surface piping and pneumatic devices, etc**. If there will be H_2S emissions associated with vented gas or tank vapors or if sour gas will be flared the applicant must contact the Division for permitting guidance **prior to construction**.

NOTE: NO internal combustion compressor engines or generator engines may be installed under the Presumptive BACT process. No pumping unit engines greater than 50-Hp or with nitrogen oxide (NO_X) emissions greater than 5 TPY may be installed under the Presumptive BACT permitting process.

Such engines must be permitted prior to installation.

NOTE: The Presumptive BACT permitting process does not apply to new or modified O&G production facilities where emission rates are known prior to startup or modification. For these facilities a C6 S2 O&G Production Facilities Permit Application must be filed PRIOR TO CONSTRUCTION or MODIFICATION.

NOTICE of INSTALLATION (NOI)

For some O&G production facilities or equipment, associated air emissions are considered relatively insignificant by the AQD. In these cases the NOI form, **FORM AQD-OG7**, serves as a complete C6 S2 permit application.

The NOI can be used for facilities such as single wellsites, consisting of only a wellhead or perhaps a separation unit, where no produced fluids are stored or dehydrated. Instead, the produced fluids are routed directly from the wellhead or separation vessels into a sales line, collection system or to a separate facility for treatment, storage and sales. The only emissions at this type of facility would be fugitive emissions from equipment leaks and fittings, or NO_X and CO emissions associated with small natural gas fired process heaters.

The NOI may be used as a complete permit application **ONLY** if **ALL** of the following apply to the facility owner:

- There are no hydrocarbon liquids storage tanks.
- There are no dehydration units.
- There are no pressurized vessels from which hydrocarbon vapors are vented to the atmosphere other than during upset or emergency conditions.
- There are no internal combustion pumping unit engines $\geq$ 50 HP or with $\geq$ 5 TPY NO_X emissions.
- There are no H_2S emissions from the facility other than those associated with fugitive leaks from process components and surface piping.
- There are no SO_2 emissions associated with the combustion of sour gas

C6 S2 O&G Production Facilities Permitting Program

Using the NOI as notification of equipment replacements and changes

The NOI may be used for notification of equipment change outs or replacements, provided the changes will not significantly increase permitted emissions, if at all. For example, use the NOI as notification of replacement of a TEG dehydration unit with one having a higher design rating but with the same model glycol pump as previously permitted, or higher rated reboiler burner. Increased emissions associated with the larger burner would be considered insignificant and there would be no emissions increase associated with the larger dehy as long as there is no change in the glycol pump model or wet gas throughput.

Another example would be to use the NOI as notification of the installation of additional production tanks at a previously permitted facility provided throughput to the current and additional tanks is the same as or less than the previously permitted throughput and provided the vent lines of the new tanks are tied into emission control devices if such was required for the existing tanks.

The NOI may be used as notification of the installation of different process heater, such as replacing a 0.5 MMBtu/hr line heater with a 0.75 MMBtu/hr line heater.

Examples are illustrated below.

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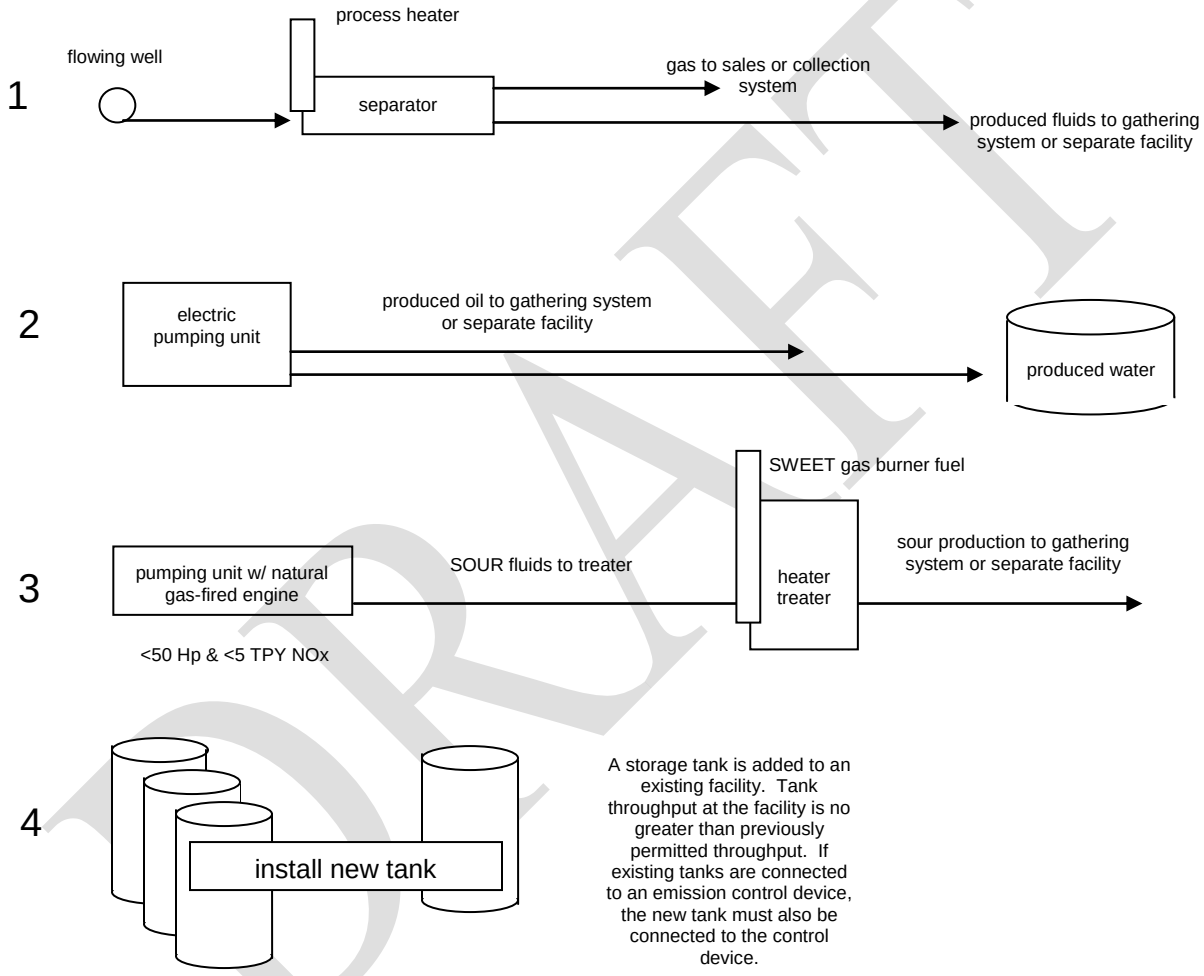
Examples of cases where the NOI may be used as a complete C6 S2 permit application or as notification of equipment changes



C6 S2 O&G Production Facilities Permitting Program

C6 S2 Permit Application Process

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How to obtain NOI Form AQD-OG7

Download electronic form from the AQD website

http://deq.state.wy.us/aqd/oilgas.asp

Contact the Wyoming Air Quality Division at **(307) 777-7391 or (307) 473-3475**

Make written request to:

Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 west 25th Street
Cheyenne, WY 82002

When/where to file a NOI

Within **60-days** of the **First Date of Production**, equipment change out, equipment replacement or equipment addition submit **EITHER** 3 paper copies (one w/ original signature) **OR** 1 paper copy w/ original signature **and** 1 electronic copy of the NOI form to:

NSR Program Manager / attn: O&G Production Facilities
Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002

First Date of Production: The date permanent production equipment is in place and product is consistently flowing to sales lines, gathering lines or storage tanks. Production occurring during well completion activities which is routed to temporary production equipment is considered to occur prior to the First Date of Production. If extended periods of time pass between zone completions but production from initially completed zones is consistently flowing to permanent production equipment, the First Date of Production is the date when production from the initial zones began consistently flowing to the permanent production equipment, even though more zones will be competed later.

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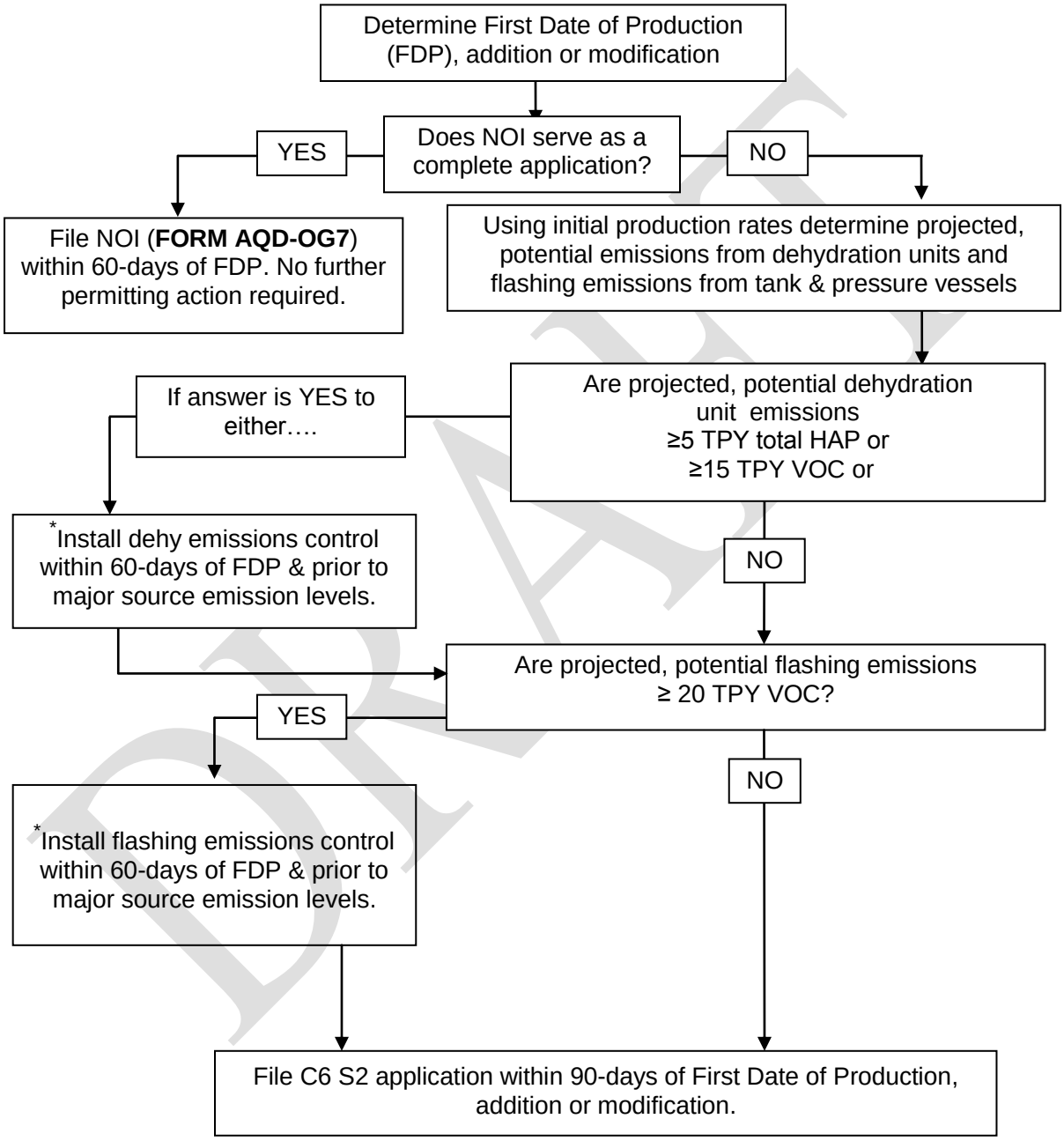
PRESUMPTIVE BACT PERMITTING PROCESS



*** combustors associated with the control of potentially major source pollutant levels must be continually monitored and recorded upon start up of the combustor.**

C6 S2 O&G Production Facilities Permitting Program

Jonah and Pinedale Anticline Development (JPAD) Area

The Jonah and Pinedale Anticline Development Area is currently defined as:

R109W & R110W in T34N
R109W & R110W in T33N
R108W, R109W & R110W in T32N
R108W, R109W & R110W in T31N
R107W, R108W & R109W in T30N
R107W, R108W & R109W in T29N
R108W & R109W in T28N
R107W, R108W & R109W in T27N

For facilities operating within this area, the Presumptive BACT permitting process varies from that for all other statewide areas.

The permitting process for the JPAD area must be done according to the July 28, 2004 addendum to the C6 S2 Oil and Gas Production Facilities Permitting Guidance. That addendum is incorporated into this current guidance revision.

For the purposes of this guidance, a PAD facility is a location where more than one well and/or associated production equipment are located, where some or all production equipment is shared by more than one well or where well streams from more than one well are routed through individual production trains located at the same or contiguous and adjacent location. If the production streams or production equipment associated with one or more wells is added to an existing single well facility, that location is then considered to be a PAD facility.

For the purposes of this guidance a single well facility is one where production equipment is associated with only one well.

A single well becomes a multiple well or PAD facility upon the First Date of Production of an additional well at the location or on the day production streams associated with an additional well or wells from separate locations are routed to the single well 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 modified facilities that do not involve new wells or added production from other wells are:

> An existing well facility is completed in additional production zones resulting in increased production and/or emissions at the facility greater than those previously permitted.
>
> Existing production equipment is replaced with larger equipment, resulting in increased potential or actual emissions.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT, C6 S2 Permitting Process

Jonah and Pinedale Anticline Development (JPAD) Area

Presumptive BACT permitting process

Emissions controls meeting Presumptive BACT requirements (described later) must be in place upon the First Date of Production at new facilities and upon the First Date of Production at modified facilities.

The C6 S2 application notifies the AQD of start up of a new facility or modification of an existing facility, describes new or modified equipment installations and associated, controlled and uncontrolled emissions and serves as a form of certification by the owner that Presumptive BACT requirements for emission controls and control device monitoring have been met.

Using the NOI as a complete C6 S2 application or as notification of equipment replacements and changes

When air emissions associated with certain sources or situations qualify as those considered relatively insignificant by the AQD, the NOI form, **FORM AQD-OG7**, serves as a complete C6 S2 permit application. For complete instructions see the discussion and examples on pages 25 through 28.

The C6 S2 Application

New single well facilities and new PAD facilities w/ no existing permits and existing single well or PAD facilities with existing permits that do not include conditions allowing for additions to be made under the July 28, 2004 JPAD addendum:

> The C6 S2 application may include future wells and production equipment which will be added to the facility up to two years after the date of application filing. This allows for one-time application filing/permitting of these types of facilities. Additional wells and production equipment, other than those included in the resulting permit, must be permitted later.

Existing single or PAD facilities with existing permits that include conditions allowing for additions to be made under the July 28, 2004 addendum:

> Applications are to be filed using the **AQD Pinedale-1 Form**. Future wells and production equipment which will be added up to two years after the date of application filing may be included. Additional wells and production equipment, other than those included in the resulting permit, must be permitted later.

Future wells:

> Future wells and production equipment which will be added up to two years after the date of application filing may be included in applications ONLY when the applicant is certain about the type and number of future wells/modifications which will be constructed, added or modified. The names, legal locations and approximate start up dates of future wells must be reported in the applications.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT, C6 S2 Permitting Process

Jonah and Pinedale Anticline Development (JPAD) Area

For all applications other than those filed on the **AQD Pinedale-1 Form**, a complete C6 S2 application includes:

- **A cover letter stating the purpose of the application**
- **A process description and process diagram for the facility including each air emission source and the operational parameters of each source** (see examples on pages 18 & 19)
- **The appropriate application forms**

AQD-OG0	Identification of application type (application or NOI = application)
AQD-OG00	Completeness checklist
AQD-OG1	Application Cover Sheet and the appropriate form for each source:
AQD-OG2	Reciprocating Engine
AQD-OG3	Glycol Dehydration Unit
AQD-OG4	Storage Tanks and Other VOC Emission Sources at **Wellsite Facilities**
AQD-OG4a	Storage Tanks and Other VOC emission sources at **Centralized Tank Batteries**
AQD-OG5	Flares/Combustion Control Devices and other Fuel Burning Equipment
AQD-OG6	Pollutant Emission Summary for all Pollutants (uncontrolled and controlled)
AQD-OG10	BACT cost analysis

- Explanations or demonstrations of all methods used to calculate or estimate emissions for each emission source, including controlled and uncontrolled sources. Emission calculation methods are described later.
- All applicable and required attachments noted on the forms, including

  Input and output for emission models/software/process simulations
  Equipment manufacturer's emissions information

  Laboratory analyses used for emission models/software/process simulations or calculations including a description of sampling procedures and handling, sampling locations, sampling location parameters (i.e., pressure and temperature at sampling port)

- Any additional attachments or information necessary for complete review of the application

Emissions reported in the application must be based on projected rates for new wells and current average production rates at the time of application filing for existing wells. Higher production rates may be used if the applicant wants to permit for production/emission increases.

For facilities requiring a permit prior to start up of operations, emissions reported in the application should be based on expected production rates. Higher production rates may be used if the applicant wants to permit for production/emissions increases.

Both controlled and uncontrolled emissions must be reported.

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT, C6 S2 Permitting Process

Jonah and Pinedale Anticline Development (JPAD) Area

When filling out the **AQD Pinedale 1 form**, it is the owner's responsibility to accurately describe ALL information requested on the forms, including existing equipment, added and removed equipment. Identify all process burners and associated ratings (MMBtu/hr), all water and condensate storage tanks and their capacities (bbl), manufacturer names, models and uses for all pneumatic pumps, model numbers and names of all dehydration unit glycol pumps, functions of all separators (HP or LP, 3-phase or 2-phase), burner ratings and sizes of all waste gas combustors, dates of production equipment and emission control equipment, dates of emission control monitoring systems or devices, etc…. AGAIN – INCLUDE ALL INFORMATION REQUESTED AND PLEASE BE ACCURATE.

How are dehydration unit emissions determined?

STEP 1: Within 30-days after the First Date of Production or modification, calculate the **average daily gas production**.

Example:
Well produced 100 MMCF during the first 30-days after the First Date of Production
average daily gas production = 100 MMCF ÷ 30 days = 3.3 MMCFD

STEP 2: Calculate the **projected first year average daily gas production** rate by multiplying the initial average 30-day rate times 0.6. This effectively results in determining a first year, average daily gas production rate which is 80% than the initial production rate. In other words, the well's initial production is projected to decline by 80% by the end of the first year of operation. First year, projected emissions are then calculated using this decline, average, daily rate for the first year of operation. See page 47 for greater explanation.

Example:
projected first year average daily gas production = 3.3 MMCFD × 0.6 = 2.0 MMCFD

STEP 3: Use GRI-GLYCalc V3.0 or higher to determine **potential uncontrolled and controlled VOC and HAP emissions** from the **process vents** of the dehydration unit associated with the projected first year average daily gas production rate. **Process vents** include reboiler still vents, glycol flash separators and still vent condensers.

NO_X and CO emissions associated with emission control combustion devices are to be calculated using the volumes of waste gas from the process vents, as predicted by the GLYCalc model, and the AP-42 flare emission factors listed in this guidance.

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Input to the GLYCalc model must include:

1) An extended hydrocarbon analysis of wet gas sampled upstream of the reboiler contact tower. Or, a composite extended hydrocarbon analysis may be used. The composite analysis must be the average wet gas composition from at least five nearby wells producing from the same formation as the new well and under the same or very similar pressure and temperature conditions. The five samples used for the composite must be no older than three years.
2) The projected first year average daily gas production rate (MMCFD).
3) Average operational parameters, including wet gas temperature and pressure, dry gas water content, glycol flash separator temperature and pressure, stripping gas source and rate and average operating parameters of emission control equipment.
4) The **maximum lean glycol circulation rate** (gpm) for the glycol circulation pump in use. Maximum circulation rates for the most commonly used Kimray Model pumps are listed in **TABLE 1** on page 12. If different pump makes are used, contact the manufacturer for the maximum rates.

Emission calculation methods are described in detail in section # of this Guidance.

When do dehydration unit emissions require control?

Emissions from the process vents of all new and existing dehydration units must be controlled upon the First Date of Production at a new facility and upon the First Date of Production after a modification to a facility, with the First Date of Production and date of modification as defined earlier. Process vents include reboiler still vents, glycol flash separators and still vent condensers.

Emissions from the process vents of temporary TEG dehydration units which are associated with skid mounted "green completion" separation equipment, do not require emission control equipment, although emission control for these units is encouraged.

Emissions from temporary dehydration units in place to accommodate initial high production rates must be controlled. These units are not considered to be associated with "green completion" equipment.

What are Presumptive BACT control requirements for dehydration unit emissions?

The following control systems or devices are accepted by the Division as meeting BACT for emissions from dehydration unit process vents (reboiler still vents and vents from glycol flash separators or glycol flash tanks):

1) Vapor recovery device (e.g. condenser, BTEX control system) that is designed and operated and may be demonstrated to reduce the mass content of total HAP and VOC in the process gases vented to the device by at least 98% by weight.
2) Enclosed smokeless combustion device or smokeless flare that is designed and operated and may be demonstrated to reduce the mass content of total HAP and VOC in the process vapors vented to the device by at least 98% by weight.

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3) Any other control device or configuration that can be demonstrated to reduce the mass content of total HAP and VOC in the process gases vented to the device or configuration by at least 98% by weight.

Emissions control equipment, systems or devices, all vent lines, connections, fitting, valves, relief valves, hatches or any other appurtenance employed to contain and collect vapors and transport them to the emission control system or device, must be maintained and operated during any time a well is producing such that the emissions are controlled at all times.

Upon the First Date of Production at a new facility and the First Date of Production after modification to an existing facility the Division requires continuous monitoring and recording of emission control components in order demonstrate continual operation and effectiveness. For a combustion device this may be a thermocouple and continuous recording device or any other equivalent device to detect and record the presence of the flame, or a combustion chamber temperature recorder/monitor. The monitoring/recording requirements become enforceable permit conditions.

How are flashing emissions determined?

STEP 1: 30-days after the First Date of Production calculate the **average daily condensate or oil production**.

Example:
Well produced 600 BPD during the first 30-days after the First Date of Production.
average daily condensate/oil production = 600 BPD ÷ 30 = 20 BPD

STEP 2: Calculate the **projected first year average daily condensate/oil production** rate by multiplying the average daily rate times 0.6. This equates to an 80% decline in condensate/oil production from the well during the first year of production. If the expected decline rate is less than 80%, then the expected decline rate should be used. Using an expected decline rate > 80% requires pre-approval from the Division.

Example:
projected first year average daily production = 20 BPD × 0.6 = 12 BPD

STEP 3: Use an approved flashing emissions model or actual measurements to determine **uncontrolled and controlled first year VOC and HAP emissions associated with the projected first year average daily production rate**.

Flashing emission models generally require:

1) an extended hydrocarbon analysis of pressurized condensate/oil sampled at the outlet of the separator or treater and upstream of the atmospheric storage tanks, at the operating conditions of the separator or treater. In other words, the sample should be that of "unflashed" condensate/oil.

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Or, a composite extended hydrocarbon analysis may be used. The composite analysis must be the average condensate/oil composition from at least five nearby wells producing from the same formation as the new well and under the same, or very similar, pressure and temperature conditions. The five samples as the basis for the composite must be no older than three years.

2) the actual operational parameters of the separation and storage equipment

Some commonly used flashing models are API E&P TANK V2, Prosim, Hysim, Hysys, ProMax, KFlash. All are simulation software based on known properties of hydrocarbon liquids and vapors and accepted chemical equations of state. Using a known composition of hydrocarbon liquids at certain conditions, the models predict the volumes and compositions of vapors that will be released from that liquid as it is exposed to changing temperatures and pressures.

Flashing emissions, especially those from pressurized vessels, may also be determined through direct measurement and analysis of the vapors. This requires careful isolation of the flash vessel so that the only route of vapor release is through a calibrated meter.

Alternate methods for determining flash emissions must receive prior approval from the Division.

When do flashing emissions require control?

Flashing emissions at all new facilities must be controlled upon the First Date of Production.

Flashing emissions from all new and existing sources at modified facilities must be controlled upon the First Date of Production after the modification.

Flashing emissions associated with skid mounted "green completion" separation equipment do not require control, although emission control is encouraged.

What are Presumptive BACT requirements for flashing emissions?

The following control systems or devices are accepted by the Division as meeting BACT for flashing emissions:

1) A vapor recovery device that is designed and operated and may be demonstrated to reduce the mass content of VOC and total HAP emissions in the vapors vented to the device by at least 98% by weight.
2) An enclosed, smokeless combustion device or flare that is designed and operated and may be demonstrated to reduce the mass content of VOC and total HAP emissions in the vapors vented to the device by at least 98% by weight.
3) Any other control device or configuration that can be demonstrated to reduce the mass content of total HAP and VOC in the process gases vented to the device or configuration by at least 98% by weight.

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Emissions control equipment, systems or devices, all vent lines, connections, fitting, valves, relief valves, hatches or any other appurtenance employed to contain and collect vapors and transport them to the emission control system or device, must be maintained and operated during any time a well is producing such that the emissions are controlled at all times.

Upon the First Date of Production at a new facility and the First Date of Production after modification to an existing facility the Division requires continuous monitoring and recording of emission control components in order demonstrate continual operation and effectiveness. For a combustion device this may be a thermocouple and continuous recording device or any other equivalent device to detect and record the presence of the flame, or a combustion chamber temperature recorder/monitor. The monitoring/recording requirements become enforceable permit conditions.

What are pneumatic pump emissions?

All gas used to motivate a pneumatic pump is ultimately discharged by the pump. If the motive gas is natural gas, as opposed to air, the vented gas contains VOC and HAP pollutants.

When do pneumatic pump emissions require control?

VOC and HAP emissions associated with pneumatic heat trace, heat medium or hot glycol circulation pumps must be controlled upon the First Date of Production at all new facilities and upon the First Date of Production after modification to an existing facility.

What are Presumptive BACT requirements for pneumatic pump emissions?

The motive gas discharge lines from the affected pumps should be tied into fuel gas supply lines or any other gas or liquid collection line which is ultimately tied into a closed system or emission control system, such as a tank vapor combustion device. If there are no such available lines with low enough operating pressure to accommodate the pump discharge gas, the pump should be replaced with an electric pump, solar operated pump, air operated pump or other such device which will eliminate the emissions. If none of these replacements is possible, BACT requirements for pneumatic pump emissions are met with no control.

How is BACT addressed for equipment other than dehydration units, flashing and pneumatic pump emissions?

BACT must be considered for:

- sources with ≥ 15 TPY VOC emissions,
- sources with ≥ 5 TPY total HAP emissions and
- pumping unit engines ≥ 50 HP OR with ≥ 5 TPY NO_X emissions.

EITHER the emission source will be controlled using BACT **OR** a BACT cost analysis will be performed and submitted with the application showing either: control is not technically feasible (i.e., due

C6 S2 O&G Production Facilities Permitting Program

to physical constraints the emissions can not be controlled) **OR** control is not economically reasonable (i.e., based on a control cost analysis the "cost to control per ton of pollutant reduced" is uneconomical).

CAUTION: BACT may be required at lower levels and for other emission sources than stated in this guidance, but as a minimum, **BACT** must be considered when equal to or above these guidance emission levels.

FORM AQD-OG10 is the BACT cost analysis worksheet.

How to obtain C6 S2 application and AQD Pinedale-1 forms

Download electronic forms from the AQD website

http://deq.state.wy.us/aqd/oilgas.asp

Contact the Wyoming Air Quality Division at **(307) 777-7391 or (307) 473-3475**

Make written request to:

Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002
attn: O&G NSR Permitting

or

Wyoming Department of Environmental Quality
Air Quality Division
152 North Durbin Street, Suite 100
Casper, WY 82601
attn: O&G NSR Permitting

When/where to file C6 S2 permit applications

For facilities where emissions are known prior to construction submit **EITHER** 3 paper copies (one w/ original signature) **OR** 1 paper copy w/ original signature and 1 electronic copy of the complete C6 S2 application **PRIOR** to construction to the address below.

For facilities constructed or modified under the Presumptive BACT process submit **EITHER** 3 paper copies (one w/ original signature) **OR** 1 paper copy w/ original signature and 1 electronic copy of the complete C6 S2 application within **60-days** of the **First Date of Production** to the address below.

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Presumptive BACT, C6 S2 Permitting Process

Jonah and Pinedale Anticline Development (JPAD) Area

For the **AQD Pinedale-1 Form** submit **EITHER** one electronic and one paper copy w/ original signature **OR** three paper copies (one w/ original signature) within **60-days** of the First Date of Production to the address below.

NSR Program Manager / attn: O&G Production Facilities
Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, WY 82002

Upon receiving the application the AQD sends a receipt letter to the applicant. The application is logged into the AQD tracking system and assigned a reviewing engineer. The engineer has up to 30-days to perform a completeness review to ensure adequate and correct information has been filed. If the application is deemed incomplete the engineer will notify the applicant and request further information. Upon completeness the engineer has 60-days to complete a technical review, write an application analysis and make any recommendations. During this process the decision to issue a permit or waiver takes place. If the decision is to issue a permit, the proposed permit, including compliance requirements, is published for a mandatory 30-day public comment period. If no comments are received the permit is issued once the public comment period ends. If comments are received these are addressed by the AQD. It is possible comments will warrant a public hearing. When this is the case, a final permit may be denied or delayed.

An hourly fee will be assessed for the time it takes AQD personnel to process the application. A bill will be sent to the applicant when the process is complete. Billing is handled as follows:

Initial billing is assessed when a proposed permit is sent to public notice. Initial billing must be paid prior to issuance of the final permit.

Final billing is assessed for waivers and permits after these are issued.

Contact the Division for the current hourly rate.

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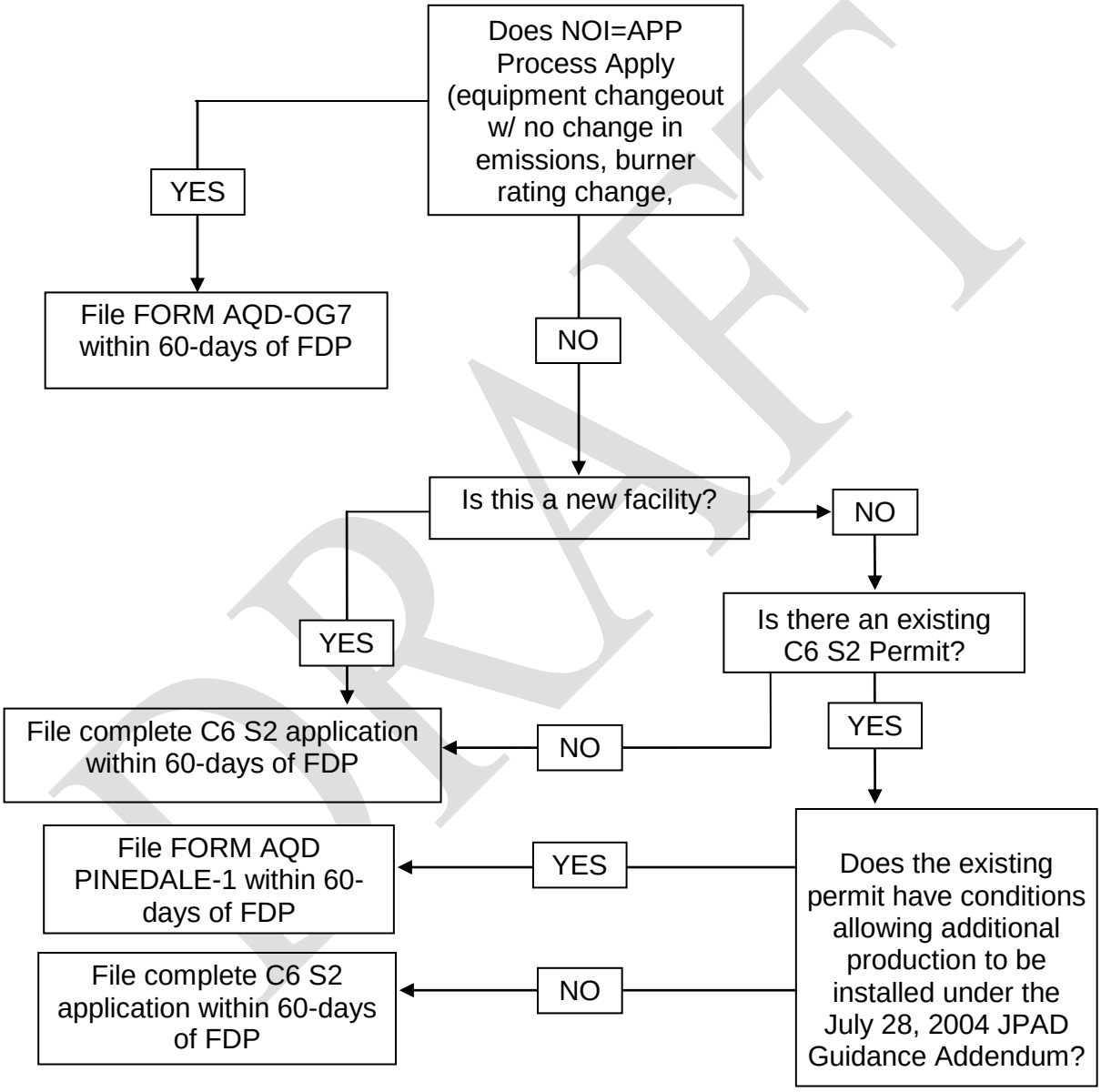
Presumptive BACT, C6 S2 Permitting Process

Jonah and Pinedale Anticline Development (JPAD) Area

PERMITTING FLOWCHART



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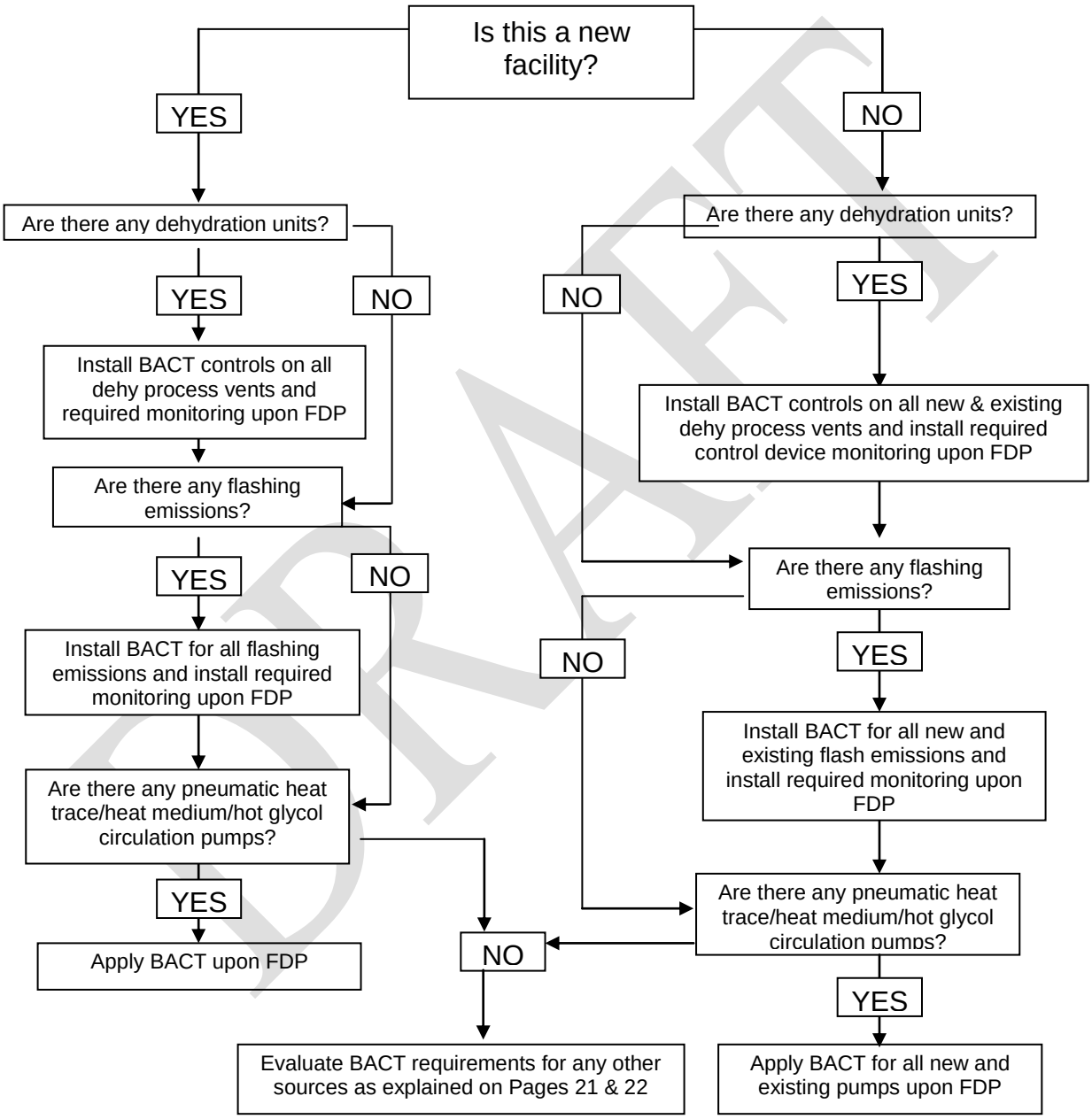
EMISSION CONTROL FLOWCHART



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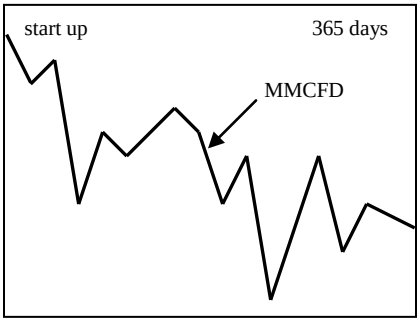
The Basis for the 0.6 Factor

The first year daily production rates are represented by the jagged line **BOX 1**. The area under the line represents the total actual production volume for the first year. It is difficult to calculate the total volume under the jagged line so it is smoothed out **BOX 2** using statistical methods.

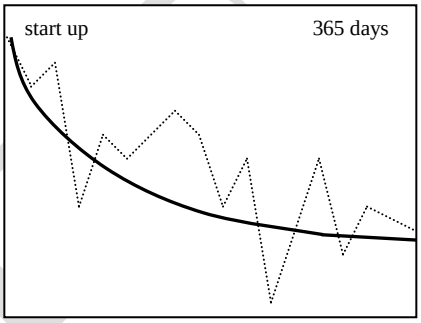
BOX 1



EXAMPLE - actual daily gas production rate vs time

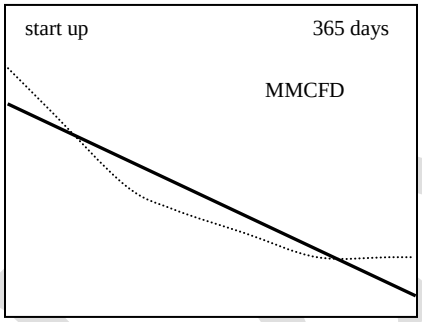
Actual production during the first year is represented by the area under the jagged line which ultimately turns out to be ≈ 730 MMCF.

BOX 2



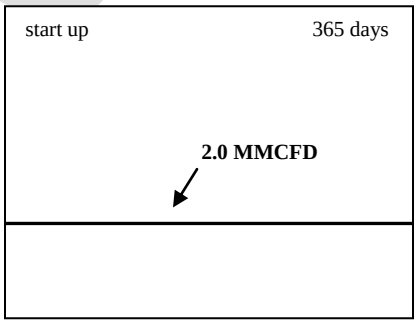
The jagged line representing daily production is "smoothed" out using statistical methods.

BOX 3



The "smoothed" curve in BOX 2 is "straightened" out using mathematical methods.

BOX 4



"leveled" out, projected daily gas production rate vs time

Total projected production for the first year is represented by the area under the straight line
2 MMCFD × 365 days = 730 MMCF

First year projected emissions are based on 730 MMCF of produced gas.

The smoothed curve is "straightened" out in **BOX 3**, then "leveled" out in **BOX 4**. Now the total production for the first year is represented by the area under the line in **BOX 4** which is easily calculated. Production curves from a large sampling of Wyoming wells indicate the average well declines by 80% during the first year. That 80% decline is represented by the level line in **BOX 4** after the first 30-day average production rate is multiplied by 0.6.

For the first month the well makes an average 3.333 MMCFD. With 80% decline during the first year, the well will make 0.667 MMCFD at the end of the first year (3.333 - 0.8(3.333) = 0.667). Then the average daily production rate over 365 days is (3.333 + 0.667)/2 = 2.0 MMCFD which is the same as 3.333 × 0.6 = 2.0.

APPENDIX A

A P P L I C A T I O N F O R M S

APPENDIX B

C A L C U L A T I O N S

C6 S2 O&G Production Facilities Permitting Program

Presumptive BACT Process

STATEWIDE & (JPAD) Area

APPENDIX C

D E F I N I T I O N S

APPENDIX D

Gas/Liquid Analyses Sample Methods