

## Comprehensive Control Standards

These standards for controlling emissions from new and existing wells are in place in various oil & gas producing jurisdictions.

Segment	Standard	Where in effect
Leaks	Require quarterly, comprehensive LDAR with no step-down.	<p><b>Wyoming:</b> <a href="#">UGRB Permit Guidance and Rules</a>;</p> <p><b>California:</b> <a href="#">California Final Regulation Order, March 25, 2016, section 95669</a></p> <p><b>Pennsylvania:</b> <a href="#">PA General Permit 5A</a></p> <p><b>Mexico Rules:</b> Chap. XI, Art. 71</p>
	<p><b>Effect on emissions:</b> Additional 20% reduction on top of NSPS for new sources; 80% reduction existing sources (Source: <a href="#">ICF Report</a>)</p>	
Gathering Station Emissions	Require quarterly, comprehensive LDAR for fugitive emissions	<p><b>California:</b> <a href="#">California Final Regulation Order, March 25, 2016, section 95669</a></p> <p><b>Ohio:</b> General Permit 18.1.c.1.c.1.c</p> <p><b>Pennsylvania:</b> <a href="#">PA General Permit 5A</a></p>
	<p><b>Effect on emissions:</b> 80% reduction for fugitives (Source: <a href="#">EPA 2016 NSPS</a>), assumes 50% of total station emissions are fugitive (Source: <a href="#">Marchese et al</a>)</p>	
Gathering Station Blowdowns	Use BMPs to minimize venting	<p>“Using Pipeline Pump-Down Techniques To Lower Gas Line Pressure Before Maintenance” (U.S. EPA, Natural Gas STAR Partners, October 2006)</p>
	<p><b>Effect on emissions:</b> 95% control (as required by the regulation)</p>	

**Comprehensive Control Standards (continued)**

<b>Centrifugal Compressors</b>	No venting from new seals on compressors  For existing, reduce emissions from wet seal fluid degassing systems on wet seal centrifugal compressors by at least 98% by either utilizing dry-seals or routing wet seal emissions to a closed system or VRU.	<b>Colorado:</b> <a href="#">Colorado Regulation Number 7, 5 C.C.R. 1001-9</a> , section §XVII.B.3.b  <b>California:</b> <a href="#">California Final Regulation Order, March 25, 2016, section 95668(d)</a>  <b>Wyoming:</b> Permitting Guidance, Wyoming Nonattainment Area Regulations, Section 6(d)(i)(A)
	<b>Effect on emissions:</b> 98% reduction on new sources, 98% reduction on existing sources <i>(as required by the regulation)</i>	
<b>Reciprocating Compressors</b>	Captured and routed to gas conversation equipment or annual testing and repair if emissions are above 2 scfm or a combined rod packing/seal emission flow rate > the # of compression cylinders * 2 scfm	<b>California:</b> 16 CARB 9566(c)(C),(D)  <b>British Columbia:</b> BC Rule 52.04(2)  <b>Canada:</b> ECCC Rules SOR/2018-66
	<b>Effect on emissions:</b> 98% reduction for subject compressors <i>(Source: <a href="#">ICF Report</a>)</i>	
<b>Dehydrators</b>	Reduce emissions of methane by at least 98% through use of air pollution control equipment	<b>Colorado:</b> <a href="#">Colorado Regulation Number 7, 5 C.C.R. 1001-9</a> , section XVII.D.3  <b>Wyoming:</b> Wyoming Nonattainment Area Regulations, Section 6(d)(1)(A) <i>(applicable to dehydrators located at well sites in the Upper Green River Basin ozone nonattainment area that have VOC emissions of 4 tons per year or more)</i>
	<b>Effect on emissions:</b> 98% reduction <i>(as required by regulation)</i>	
<b>Tanks</b>	If all tank emissions are 4 tpy of VOCs or more, use VRU if feasible; if not route to flare.	<b>California:</b> <a href="#">California Final Regulation Order, March 25, 2016</a> , section 95668(a)(6) <i>(Separators &amp; tanks that receive an average of 50+ barrels of crude oil or condensate/day.) Note: CA uses methane not VOCs.</i>
	<b>Effect on emissions:</b> 98% reduction for subject tanks <i>(EDF's assumption when emissions sent to control devices.)</i>	

**Comprehensive Control Standards (continued)**

<b>Pneumatics</b>	Zero bleed for all new controllers	<b>California:</b> <a href="#">California Final Regulation Order, March 25, 2016</a> , section §95668(e)(2), §95668(e)(3)
	Existing low-bleed phased out over time and replaced with zero bleed, which can include routing emissions to closed loop system	<b>Colorado:</b> <a href="#">Colorado Regulation Number 7, 5 C.C.R. 1001-9</a> , section §XVIII.C.1.b, XVIII.C.3.b; §XVIII.F
	Intermittent bleed covered by LDAR.	<b>Mexico Rules:</b> Ch. IV, Art. 47
		<b>British Columbia:</b> Rule 52.05(2),(3)
		<b>Ohio:</b> General Permit 18.1.C.1.d.2.b
	<b>Effect on emissions:</b> 100% reduction if zero-bleed, 51% reduction for quarterly surveys of intermittent bleed <i>(Source: EDF analysis using Allen et al 2015)</i>	
<b>Pumps</b>	Zero bleed for new pumps.	<b>California:</b> <a href="#">California Final Regulation Order, March 25, 2016</a> , section 95668(e)(4).
	98% control if control available onsite for existing pumps.	<b>Wyoming:</b> Wyoming Nonattainment Area Regulation §6(e) <i>(applies to existing pumps in the UGRB ozone nonattainment area).</i>
	<b>Effect on emissions:</b> 100% for new, zero-bleed; 98% for applicable existing pumps <i>(Basin-specific onsite control availability estimates for existing sites are based on WRAP inventory data)</i>	
<b>Associated Gas Venting</b>	No venting except during emergencies or when needed for safety	<a href="#">BLM: 2016 Venting and Flaring Rule</a> , 81 F.R. 83008, 83082 (Nov. 18, 2016);
	<b>Effect on emissions:</b> 100% control/capture, 5% safety exception: overall reduction of 95% <i>(as required by regulation)</i>	
<b>Associated Gas Flaring</b>	Prohibition on routine flaring except during emergencies and mandatory submission of a gas capture plan	<b>Alaska:</b> <a href="#">Alaska Admin. Code 20, § 25.235.</a> <b>Norway:</b> <a href="#">Petroleum Act 1996, Article 4-4</a>
	<b>Effect on emissions:</b> Not yet estimated	

**Comprehensive Control Standards (continued)**

<p><b>Liquids Unloading</b></p>	<p>Create differential pressure to minimize the need for venting during unloading activities &amp; operator must remain onsite.</p>	<p><b>Colorado:</b> <a href="#">Colorado Regulation Number 7, 5 C.C.R. 1001-9</a>, section XVII.H.1.a  BLM: 43 C.F.R. § 3179.204; Mexico Rules, Chap. IX, Art. 66</p>
	<p><b>Effect on emissions:</b> 25% minimum reduction (<a href="#">Source: WZI Report</a>)</p>	