437 Hydraulic Fracturing Chemical Additives

Operator Training

May 11, 2021

COLORADO
Oil & Gas Conservation Commission
Department of Natural Resources

Peter Gintautas, Ph.D.
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- **437. Hydraulic Fracturing Chemical Additives.**

- a. After January 15, 2021, Operators will not use the chemicals listed in Table 437-1 as additives in Hydraulic Fracturing Fluid.

From the SBP

- "Rule 437.a prohibits the use of the chemical additives listed in Table 437-1 after the effective date of the 200–600 Mission Change Rulemaking. The Commission determined that the chemicals additives listed in Table 437-1 were the appropriate additives to prohibit statewide based on the study by Jessica D. Rogers *et al.* (2015), which identified compounds used as fracturing fluid additives with high mobility and persistence in the environment that posed the greatest risks to public health and the environment if spilled or released. Multiple local government jurisdictions have prohibited the use of a similar list of fracturing fluid additives based on the same study. Based upon an independent review of the study and the listed chemicals by the Commission's Staff with expertise in geochemistry and other relevant subject matter, the Commission determined that it was necessary and reasonable to prohibit most of the chemicals identified as posing risks by the Rogers *et al.* (2015) study. However, the Commission chose not to prohibit one chemical that was identified as posing risks by the Rogers *et al.* (2015) study—polysorbate 80. Polysorbate 80 is a polymer with a wide range of uses, including in some pharmaceuticals and food products. It is used as a surfactant in hydraulic fracturing fluid, and according to the FracFocus database, it is used more frequently in Colorado than the other additives identified in Table 437-1. Because of the relatively lower risks it poses to human health, and the frequency of its use, the Commission determined that it was inappropriate to prohibit the use of polysorbate 80 as a fracturing fluid additive during the 200–600 Mission Change Rulemaking."

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- b. This Rule 437 does not prevent Operators from recycling or reusing produced water that has naturally occurring, trace amounts of chemicals listed in Table 437-1.

From the SBP

- "The Commission intends for the chemical prohibition in Rule 437.a to apply only to chemical additives, but not base fluids, to allow for the reuse and recycling of produced water in drilling and hydraulic fracturing operations. Accordingly, in Rule 437.b, the Commission clarified that the prohibition on chemical additives listed in Table 437-1 does not apply to naturally occurring, trace amounts of those chemicals found in produced water."

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- **c.** For any chemical constituent listed in Table 437-1 for which Table 915-1 also provides a standard, the concentration in recycled or reused produced water will be below the Table 915-1 standard, or the unconcentrated naturally occurring background level, whichever is greater.

From the SBP

- "As a method of verifying compliance with Rule 437.b, in Rule 437.c, the Commission required concentrations of chemicals listed in Table 437-1 in recycled produced water to be either below Table 915-1 standards or below naturally occurring, unconcentrated background levels, whichever is greater. This ensures that Rule 437.b's exception allowing for trace amounts of naturally occurring contaminants in reused and recycled produced water does not result in concentrating those contaminants at concentrations that may pose risks to public health or the environment. The Commission recognizes that there is a tradeoff between encouraging reuse and recycling of produced water and prohibiting the presence of chemicals above the thresholds in Table 915-1 or naturally occurring background levels in reused or recycled water. However, the Commission determined that the benefits of protecting public health, the environment, and drinking water supplies by prohibiting the use of the additives listed in Table 437-1 outweigh the foregone benefits of potentially reducing the amount of produced water that can be reused or recycled."

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Table 437-1 Annotated

Compound	Reg. 41 threshold µg/l	Notes
benzene	5	
lead	50	
mercury	2	**Naturally occurring, must determine background and that water to be reused in hydraulic fracturing fluids < naturally occurring background in source produced water**
arsenic	10	
cadmium	5	
chromium	100	
ethylbenzene	700	
xylenes (total)	1400	
1,3,5-trimethylbenzene	67	
1,4-dioxane	0.35	Not considered to be naturally occurring, must be < Reg. 41 standard
1-butanol	no standard	**Not considered to be naturally occurring, Must determine that chemical not present in products utilized downhole at source wells**
2-butoxyethanol	no standard	
N,N-dimethylformamide	no standard	
2-ethylhexanol	no standard	
2-mercaptoethanol	no standard	
benzene, 1,1'-oxybis-,tetrapropylene derivatives, sulfonated, sodium salts (BOTS)	no standard	
butyl glycidyl ether	no standard	
quaternary ammonium compounds, dicoco alkyldimethyl, chlorides (QAC)	no standard	
bis hexamethylene triamine penta methylene phosphonic acid (BMPA)	no standard	
diethylenetriamine penta (methylene- phosphonic acid) (DMPA)	no standard	
FD&C blue no. 1	no standard	
tetrakis (triethanolaminato) zirconium (IV) (TTZ)	no standard	

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- **304.c(18). Water Plan**

- **304.c.(18)C. If recycled or reused water is anticipated to be used, a description of the source of that water, background concentrations of chemicals listed in Table 437-1, …**

From the SBP

- "Additionally, consistent with Rule 437, which prohibits the use of certain chemical additives in hydraulic fracturing fluids, Rule 304.c.(18).C requires operators to provide background concentrations of chemicals listed in Table 437-1. In order to determine whether the concentrations of the chemicals listed in Table 437-1 in produced water that is reused and recycled are in fact trace background concentrations, the Commission's Staff and operators will need a baseline metric to compare against. Rule 304.c.(18).C allows an operator to provide basic information about anticipated characteristics of background concentration of Table 437-1 chemicals in produced water that will be reused and recycled during the planning phase so that operators and the Commission's Staff have ready access to this information when ensuring compliance with Rule 437.b."

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- **Naturally Occurring Background**

- The Commission’s Staff and operators will need a baseline metric to compare against to ensure compliance with Rule 437 when recycling or reusing produced water that has naturally occurring, trace amounts of chemicals listed in Table 437-1.

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