

Clean Air Act 110I Demonstration – No Adverse Air Quality Impact of Proposed Amendment to Air Quality Rule R307-304. Solvent Cleaning

Introduction

Section 110(I) of the Clean Air Act (CAA) prohibits EPA from approving a State Implementation Plan (SIP) revision if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress, or any other applicable requirement of the CAA. When revisions to state SIP rules are made, the Act requires that an analysis is completed to verify that the rule will not be relaxed in a way that would be impermissible under Section 110(I). This demonstration is being submitted for public comment because the Division of Air Quality (DAQ) is amending R307-335 and proposing new rule R307-304.

Proposed Rule Revision

Section 7 of the existing degreasing rule R307-335 will be removed to create a new rule called R307-304.

Excerpt of R307-335-7

R307-335-7. Industrial Solvent Cleaning.

- (i) Using solvents (excluding water and solvents exempt from the definition of volatile organic compounds found in R307-101-2) with a VOC limit in Table 1; or
- (ii) Installing an emission control system designed to have an overall capture and control efficiency of at least 85%.

TABLE 1
Solvent Cleaning VOC Limits

| Solvent Cleaning Category | VOC Limit (lb/gal) |
|--|--------------------|
| Coatings, adhesives and ink manufacturing | 4.2 |
| Electronic parts and components | 4.2 |
| General miscellaneous cleaning | 2.5 |
| Medical devices and pharmaceutical | |
| Tools, equipment and machinery | 6.7 |
| General surface cleaning | 5.0 |
| Screening printing operations | 4.2 |
| Semiconductor tools, maintenance and equipment | |
| Cleaning | 6.7 |

In new rule R307-304, DAQ is proposing to replace the 2.5 lb/gal limit for general miscellaneous cleaning. This limit will be replaced with a vapor pressure limit of up to 8 mm Hg at 20 degrees Celsius that can be used for miscellaneous cleaning and in place of any other limit listed in Table 1 of new rule R307-304.

Rule Revision Analysis

The purpose of R307-304 is to reduce the amount of volatile organic compounds (VOCs) that are emitted into the atmosphere in the Wasatch Front, Cache Valley and Tooele County, as a way to improve winter-time air quality. These VOCs contribute to the development of fine particulates that become suspended in our airsheds during inversion periods.

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Traditionally, we have developed density based limits (lb/gallon) for solvent use categories. We have come to realize that as we tighten the density based limits in order to further improve our air quality, we are faced with technical and safety limitation because we preclude the use of all solvents but acetone. Acetone is not a universal solvent. It cannot be used for every industrial solvent cleaning operation. There are also safety and health concerns with the wide use of acetone. Consequently, we are proposing to offer an alternative option of using low vapor pressure solvent formulations.

Why Is It Time To Move Away From A Density Limit?

Our intent is to continue to find ways to reduce VOC emissions. Solvent use is a significant source of fugitive VOC emission. Lowering the density limit below 2.5 lb/gallon for general solvent use would further remove all possibility of using any other solvent but acetone. The disadvantages of acetone are:

- Acetone works well for cleaning waxes, fats, oils varnishes and resins. It does not work well for grease, a variety of different types of coatings and paints, which are subject of the many Utah air quality rules.
- Acetone has a high vapor pressure (explained below), so it quickly evaporates which can make it difficult to use in industrial cleaning operations. Volatile acetone vapors can gather and pool at points around a work area creating explosion and fire hazards, particularly given the extremely low flash point for acetone.
- Acetone poses a safety risk because it is highly flammable. Acetone has an extremely low flash point which makes it susceptible to flaming.
- Acetone poses a health risk because it causes irritation of the eyes, nose and throat. At high exposures, it can cause nausea, confusion, and dizziness.

As we look forward to improve our air quality, we must find an alternative to a density limit that will reduce VOC emissions and provide industry with formulation choices.

Why Change The Form Of The Limit To Vapor Pressure?

Vapor pressure is a measure of the tendency of particles to escape from the liquid form of a chemical to an airborne vapor, at room temperature. It is an indicator of a liquid's evaporation rate. Substances with a high vapor pressure readily release vapors into the air. Consequently, it is desirable for sources to use chemicals with low vapor pressure when possible in order to reduce VOC evaporation.

The advantages of low vapor pressure solvent formulations include:

- The low solvent evaporation rate reduces product wastage. Surface cleaning solvents are only effective in their liquid state. This means that the more they evaporate, the more solvent is needed to complete the task. Using less solvent saves cost.
- The low solvent evaporation reduces emissions to the outdoor air.
- The low solvent evaporation reduces emissions in the work place, improving worker safety.
- Using low vapor pressure solvent formulations avoids the use of hazardous air pollutant chemicals like methylene chloride.

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How Will Using A Vapor Pressure Limit Provide More Cleaning Options?

Excellent cleaning solvents like xylene have a high vapor pressure. If the vapor pressure of a xylene solution can be suppressed, xylene could be used for cleaning while reducing emissions. This can be done by applying a physical-chemical phenomenon known as Raoult's Law. Raoult's Law states that when a substance is dissolved in a solution, the vapor pressure of the solution will decrease. Finding ways to formulate salts (the substance) for example, into a xylene solution, will dramatically reduce the vapor pressure of the solution. Changing the form of the limit will permit formulation chemists to come up with more cleaning options while reducing VOC emissions.

Is The Change Of Form A Relaxation Of The Rule?

The EPA issued a guidance document for VOC cleaning emissions called, *Control Techniques Guidelines: Industrial Cleaning Solvents* (EPA 453/R-06-001). This guidance document provides recommended control measures that include options to reduce VOC emissions. One of those options is to apply a composite vapor pressure limit of 8 millimeters of mercury (mmHg) at 20 degrees Celsius.

Conclusions

1. Changing the form of the limit is not a relaxation of the rule.
2. The proposed vapor pressure limit is more stringent than the current general miscellaneous cleaning limit.
3. The proposal will improve air quality.

Public Comment

DAQ is accepting public comment on this demonstration from July 1, 2017, to July 31, 2017. Comments can be submitted by e-mail to Jkarmazyn@utah.gov or by mail to:

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