

Enviroscope

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FORM R Reporting for Nitrate Compounds

Inventory (Form R), and you neutralize that acid on-site in your pretreatment system, there is a good chance that you are required to submit a Nitrate Compounds Form R report.

On November 30, 1994, The U.S. Environmental Protection Agency (EPA) finalized the addition of 286 chemicals and chemical categories to the Emergency Planning and Community Right-to-know Act (EPCRA) section 313 toxic chemical list, including the category "Water Dissociable Nitrate Compounds" (aqueous solution only). Metal finishing operations have many uses for nitric acid for normal operation. The treatment of nitric acid through pH adjustment will generate a monovalent nitrate compound (sodium nitrate).

Threshold Determination Here is a basic example: In a calendar year, a metal finishing facility neutralizes 50,000 lb (approximately 5,500 gal) of 89-percent concentrated nitric acid with sodium hydroxide onsite through its wastewater pretreatment system. The nitric acid is 100percent neutralized, and the nitrate compound formed as a result of the treatment is sodium nitrate. The threshold for reporting nitrate compounds is 25,000 lb over the year. The quantity of nitric acid that is neutralized (generating sodium nitrate) is 89 percent of the 50,000 lb of HNO₃ (44,500 lb). The molecular weight of HNO₃ nitric acid is 63.01 kg/kmol, and the molecular weight (MW) of sodium nitrate is 84.99 kg/ kmol. The quantity of nitric acid neutralized is converted first to kilograms and then to kilomoles using the following equations:

• Kilograms of HNO_3 neutralized = (lb HNO_3)

neutralized) x (0.4536 kg/lb) • Kilomoles of HNO₃ neutralized = (kg HNO₃) / (MW of HNO, in kg/kmol)

Substituting the example values into these equations gives us:

- Kilograms HNO_3 neutralized = 44,500 lb x 0.4536 kg/lb = 20,185 kg
- Kilomoles of HNO₃ neutralized = 20,185 kg / 63.01 kg/kmol = 320.3 kmol

The quantity of sodium nitrate generated in kilomoles is equal to the quantity of nitric acid neutralized (320.3 kmol). The quantity of sodium nitrate generated in kilomoles is first converted to kilograms and then to pounds using the following equations:

- Kilograms NaNO₃ generated = (kmol NaNO₃) x (MW of NaNO₃ in kg/kmol)
- Pounds NaNO₃ generated = (kgNaNO₃) x (2.205 lb/kg)

Substituting the values yields:

- Kilograms of NaNO₃ generated = $(320.3 \text{ kmol}) \times (84.99 \text{ kg/kmol}) = 27,222 \text{ kg}$
- Pounds of NaNO₃ generated = (27,222 kg) x 2.205 lb/kg = 60,025 lb.

The 60,000 lb of sodium nitrate generated is used to determine whether or not the threshold has been exceeded (over 10,000 lb or 25,000 lb). Only the nitrate ion portion of the compound need be reported as a release.

Caution Note: Many metal finishing operations at a plating facility will form additional water dissociable nitrate compounds other than sodium nitrate. For example, bright dipping of brass will form a divalent copper nitrate compound. The quantity of that nitrate compound manufactured in the acid bath will need to be counted toward threshold determinations, even if it is treated off-site by a treatment, storage and disposal (TSD) facility. Any water dissociable nitrate compounds formed in metal finishing processes are considered "Manufactured—As A Byproduct" on the Form R (Page 3, Section 3.1, a. & e.).

Calculating Releases

For calculating and reporting releases, you only need to count the nitrate ion portion. To determine the amount of nitrate ion quantity released from the sodium nitrate compound, you must first obtain the (MW) of sodium, nitrogen, and oxygen:

Element	MW
Na	= 22.9898
Ν	= 14.0067
0	= 15.9994

The nitrate portion of the sodium nitrate can be calculated using the following equation:

 $\frac{\text{MW of Nitrate Ion}}{\text{MW of Sodium Nitrate}} = \frac{62.0049}{84.9947} = 0.72951 \text{ is NO}_3$

Knowing that the nitrate ion is 72.9 percent of the sodium nitrate compound, we can determine the amount of nitrate ion released:

 $(60,000 \text{ lb NaNO}_3) \ge (0.72951) = 43,770 \text{ lb}$ NO₃ released

Note: Remember, the deadline for submitting the annual Form R is July !!

Bibliography

EPA Document EPA745-R-95-002 List of Toxic Chemicals within the Water Dissociable Nitrate Compounds Category and Guidance for Reporting.