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REAFFIRMED 2022

GUIDELINE FOR THE OPERATION AND CLOSURE OF CARBIDE LIME PONDS

FOURTH EDITION

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NOTE—Technical changes from the previous edition are underlined.

NOTE—No technical information has been changed from the 2017 edition. This reaffirmed edition may include minor editorial changes.

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1 Introduction

This guideline has been written in response to the demand for information relating to the proper operation and closure of carbide lime ponds.

2 Scope and purpose

This guideline is intended for use by owners and operators of carbide lime ponds and others providing services to these entities. Its purpose is to provide guidance on how to responsibly operate and close carbide lime ponds associated with the manufacture of acetylene gas from calcium carbide.

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 **Shall**

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 **Should**

Indicates that a procedure is recommended.

3.1.3 **May**

Indicates that the procedure is optional.

3.1.4 **Will**

Is used only to indicate the future, not a degree of requirement.

3.1.5 **Can**

Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 **Calcium carbide**

Nonflammable chemical compound of calcium and carbon that reacts with water to produce acetylene gas and carbide lime.

3.2.2 **Carbide lime**

Calcium hydroxide (calcium hydrate) derived from the reaction of calcium carbide and water.

NOTE—Lime refers to carbide lime unless otherwise specified.

3.2.3 **Co-product**

Material such as lime slurry that is a product of a process produced for the general public's use and is ordinarily used in the form it is produced by the process.

NOTE—See Title 40 of the U.S. *Code of Federal Regulations* (40 CFR) Part 261.1(c) [1].¹

3.2.4 **Hazardous waste**

Solid waste as defined in 40 CFR 261 [1].

NOTE—In Canada, waste management is governed by provincial as well as federal regulations under the *Canadian Environmental Protection Act* [2]. Operators of lime ponds should reference the environmental regulations of the province where the lime pond is operated for specific definitions [1].

¹ References are shown by bracketed numbers and are listed in order of appearance in the references section.

3.2.5 Hazardous waste under the characteristic of corrosivity

Solid waste that is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5 as determined by using Methods 9040B or 9045C in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, U.S. Environmental Protection Agency (EPA) SW-846 [3].

NOTE—In Canada, waste management is governed by provincial as well as federal regulations under the *Canadian Environmental Protection Act* [2]. Operators of lime ponds should reference the environmental regulations of the province where the lime pond is operated for specific definitions [1].

3.2.6 Lime paste

Carbide lime and water mixtures typically containing greater than 45% solids.

3.2.7 Lime pond

Natural or manmade structure generally formed by earthen materials used to store and contain carbide lime before sale.

3.2.8 Lime pond closure

Overall process to responsibly decommission a lime pond with any necessary approvals from applicable regulatory agencies.

3.2.9 Lime slurry

Carbide lime and water mixtures typically containing 10% to 45% solids.

3.2.10 National/state pollution discharge elimination system (NPDES/SPDES) permit

Authorization, license, or equivalent control document issued by the U.S. EPA or a state environmental agency to implement the requirements associated with point-source wastewater or storm water discharges.

3.2.11 pH

Hydrogen ion activity of a solution expressed as the logarithm of the reciprocal of the hydrogen ion concentration in moles per liter at 25 °C (77 °F).

NOTE—The practical pH scale extends from 0 (very acidic) to 14 (very alkaline) with 7 corresponding to exact neutrality.

3.2.12 Pozzolanic effect

Reaction between siliceous or aluminosiliceous material (soils, sand, etc.) and alkaline hydroxides (such as lime) in the presence of moisture to form compounds having cement-like properties.

3.2.13 Publicly owned treatment works (POTW)

System managed by a public agency to collect and treat sanitary and approved industrial wastewaters.

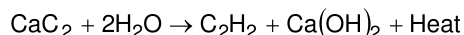
3.2.14 Solid waste

Any discarded, disposed of, burned, or incinerated material that is not excluded by 40 CFR 261.4(a) or that is not excluded by variance granted under 40 CFR 260.30 and 260.31 [1].

NOTE—In Canada, waste management is governed by provincial as well as federal regulations under the *Canadian Environmental Protection Act* [2]. Operators of lime ponds should reference the environmental regulations of the province where the lime pond is operated for specific definitions [1].

4 Carbide lime technical issues**4.1 Chemical/physical properties of carbide lime**

Carbide lime is a co-product generated through a reaction of calcium carbide and water during the acetylene manufacturing process. It is also referred to as lime slurry, lime hydrate, carbide slurry, and generator slurry. The chemical equation for this reaction is:



A large amount of excess water is used in the wet process to produce calcium hydroxide in slurry form with 10% to 15% solids.

The calcium carbide used in this process is manufactured by the reduction of high-quality quicklime (calcium oxide) with carbon from selected cokes at high temperatures of the carbide electric furnacing process. The acetylene manufacturing process produces a consistent quality hydrated lime with chemical properties that vary slightly depending on the calcium carbide source and production conditions.

Carbide lime has a chemical analysis comparable to high-grade hydrated lime (see CGA G-1.5, *Guideline for Carbide Lime: Its Value and Uses*) [4]. Carbide lime has a fine particle size and a characteristic grayish tint due to finely divided carbon and ferrosilicon. Small quantities of acetylenic impurities give carbide lime a characteristic odor, which quickly dissipates when exposed to air. Measuring the pH of carbide lime is a highly temperature-dependent endeavor and should be done under controlled laboratory conditions (see 5.1 for further information on carbide lime pH).

Lime slurry from a wet generating process is generally processed to increase the solids content through lime ponds, decanting, membrane filtration, mechanical thickeners, and mixing with quicklime. Lime ponds, which also function as a storage facility, are usually excavations with earthen dike perimeters.

Inactive lime ponds usually form a crusty surface when dry. This is due to the natural reaction of atmospheric carbon dioxide with calcium hydroxide to form calcium carbonate. However, calcium hydroxide remains stable several inches below the carbonate surface of the pond.

4.2 Lime uses

Carbide lime is a versatile material that can often substitute for commercial hydrated lime. It is used in many chemical and industrial processes for neutralization, coagulation, precipitation, hydrolysis, chemical reactions, and numerous other applications. It is also used in agriculture for soil sweetening and for soil stabilization in highways, airfields, and other structural projects. Many environmentally beneficial uses include wastewater pH adjustment, lime precipitation of sewage effluent, sewage sludge stabilization, water purification and softening, neutralization of acidic waste streams, flue gas desulfurization of power plants, and stabilization of hazardous waste before disposal. It is also used to close hazardous waste sites. See CGA G-1.5 for a further description of carbide lime applications [4].

5 Regulatory issues for carbide lime

5.1 Carbide lime—a co-product

Carbide lime is a co-product resulting from the manufacture of acetylene gas from reacting calcium carbide with water. Carbide lime is sold for many uses including but not limited to those identified in 4.2. In many cases, the lime meets American Society for Testing and Materials (ASTM) purity standards before use [5].

As long as the lime is being marketed actively, it is considered a product and not a solid waste. Due to the beneficial properties of lime in land application as described in 4.2, closure of lime ponds in strict accordance with solid waste regulatory requirements can be unnecessary and unwarranted. In this publication, CGA has identified responsible best practices to safely operate and close lime ponds while mitigating potential adverse environmental impacts.

Carbide lime that can be classified as a solid waste is not considered a hazardous waste according to U.S. regulations. On November 13, 1979, EPA removed calcium hydroxide from the hazardous substance list under Section 311 of the *Clean Water Act* since it does not exceed the acute toxicity criterion when discharged to the environment [6]. Further, on May 19, 1980, EPA finalized regulations that adjusted the upper pH limit to 12.5 for hazardous waste under the characteristic of corrosivity. EPA established this upper pH limit principally so it would not inhibit lime use for beneficial processes such as waste stabilization. Finally, on April 5, 1995, EPA issued a regulation establishing a temperature range of 24 °C to 26 °C (75 °F to 79 °F) to use when analyzing the pH of materials for the corrosivity characteristic when the material has a pH greater than 12. Since carbide lime cannot have a pH greater than or equal to 12.5 under these laboratory conditions, carbide lime is not a hazardous waste under the corrosivity characteristic [7].