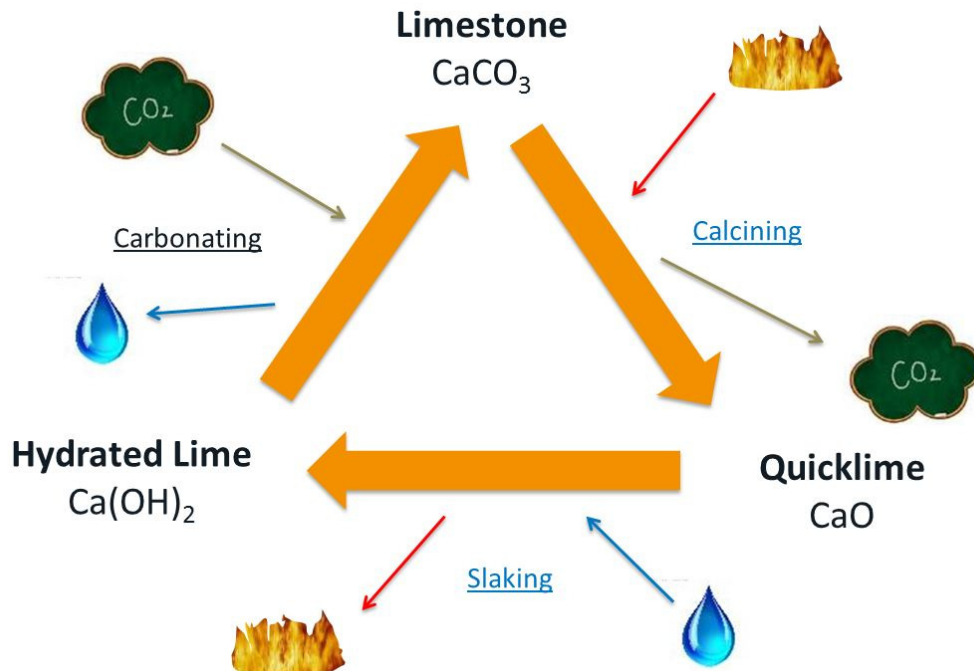


WHAT IS LIME?



Three chemicals, and one fruit, are commonly referred to as “Lime”. With the exception of the fruit, they all can be used to do roughly the same job, but the handling and processing of the three is significantly different. It is therefore extremely important to determine exactly which type of lime we are working with early in project development.

The three forms of chemical lime are Calcium Carbonate (CaCO_3), Calcium Oxide (CaO), and Calcium Hydroxide (Ca(OH)_2). These three are directly linked, and together form what is often referred to as the Calcium or Lime Triangle.



WHAT IS LIME?

Calcium carbonate (CaCO_3) is the raw form of lime found in nature and is more commonly referred to as Limestone. Because limestone is quarried, it can be purchased in just about any form imaginable, but we primarily deal with it in a powdered or pebbled form. It should be noted that the “Lime” that is used agriculturally or available in a garden center is limestone often dolomitic limestone (combination of calcium and magnesium carbonate). Calcium carbonate can also be found naturally in shells (egg, or seashells) but is rarely produced in mass quantities from these forms.

When calcium carbonate is “Calcined” (fired in a kiln at a temperature in excess of $900\text{ }^\circ\text{C}$), carbon dioxide (CO_2) is driven off leaving calcium oxide (CaO), more commonly called quicklime. The physical shape of quicklime will depend primarily on the shape of the limestone being fed into the kiln, the type of kiln, and the handling of the material once calcined. It is, however, most commonly shipped in pebble form, so quicklime may occasionally be referred to as Pebbled Lime. While not actually in common use in the English language, “Live Lime” may be used to refer to calcium oxide as a result of literal translations from other languages.

For most applications quicklime is not used directly in a process, it is usually first combined with water to form the third form of lime, calcium hydroxide ($\text{Ca}(\text{OH})_2$). This reaction is called “slaking” when done with excess water or, “hydrating” when done with little, or no, excess water. Leading to two of the names used for calcium hydroxide, Slaked Lime and Hydrated Lime (the latter being the most common). The reaction between quicklime and water is exothermic (gives off heat) so specialized equipment is required control this process. The term “Slaker” is used for a machine that controls the slaking reaction (wet process), while a “Hydrator” is used for the Hydrating reaction (dry process). Some care should be taken when working with specifications or requirements that have been translated as these two terms will often get mixed up. Lime suppliers will in general operate their own hydrators and can supply hydrated lime in a dry powdered form. For this reason it is occasionally called Powdered Lime, which can be misleading and confusing as both limestone and quicklime are also available in powdered form. Hydrated Lime Slurry, often called just Lime Slurry, may also be referred to as Milk of Lime because of its white milk-like colour. Translated documents may also refer to lime slurry as Whitewash, while technically correct this term is rarely used industrially to refer to lime slurry.

WHAT IS LIME?

Finally if we allow hydrated lime to re-combine with CO₂, it will close the triangle and return to calcium carbonate (and release a water molecule).

This form of lime is technically the same chemical as raw limestone but when manufactured deliberately (for the paper industry in particular) it is generally referred to specifically as calcium carbonate. It may also be called Precipitated Calcium Carbonate (PCC). Calcium carbonate can also form in slurry tanks and lines and is the origin of the vast majority of the Lime Scale found in lime systems.

Below is a table of some of the common names we have seen for Lime and generally which compound they refer to.

<u>CaCO₃</u>	<u>CaO</u>	<u>Ca(OH)₂</u>
<ul style="list-style-type: none"> • Calcium Carbonate • Limestone • Precipitated Calcium Carbonate (PCC) • Agricultural Lime • Lime Scale 	<ul style="list-style-type: none"> • Calcium Oxide • Quicklime • Pebbled Lime • Live Lime (French translation) • Hot Lime 	<ul style="list-style-type: none"> • Calcium Hydroxide • Hydrated Lime • Slaked Lime • Powdered Lime • Lime Slurry • Milk of Lime • Whitewash