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The history of paint quickly developed after the Industrial Revolution. New technologies created a demand for a paint market. Around 1770 Thomas Child opened the first paint mill in America ([www.paint.org/ind\\_info/history.cfm](http://www.paint.org/ind_info/history.cfm)). In Ohio in 1867 D.R. Averill patented the first ready-mixed paints. Shortly after this many factories sprung up in heavily populated areas across the nation. Transporting paint was expensive due to its weight, which is why factories strategically chose their locations. Eventually oil-based paints lost their popularity, and in 1978 lead-based paints were outlawed by the Consumer Product Safety Commission.

Latex paint holds the popular vote of painters today because of its great qualities. The composition of latex paints demonstrates its popularity. It is water-based and contains resins, solvents, color pigment, and additives. Resins such as acrylics, vinyls, and epoxies, form a film or coating on the surface. Solvents keep the paint liquefied until its application. Pigments provide the variety in color. The other additives help as driers, thickeners, or anti-foam agents.

The health and safety issues regarding latex paints are not very extensive. Painting always requires ventilation because the fumes may contain harmful chemicals – this is no different with latex ([www.paintingyourhouse.info/health.htm](http://www.paintingyourhouse.info/health.htm)). Its composition allows for easy clean ups. Soap and water perform just as well as paint thinner, providing a safer situation. While painting, direct contact with the eyes should be avoided. Also, as stated earlier, the paint does not contain any lead.

The versatility of latex paints and its performance contribute to its widespread use. When painted on wood surfaces it lasts at least ten years and the chemicals in the paint help prevent peeling and flaking ([www.paintquality.com/library/otherpublications/sp2002\\_article2.htm](http://www.paintquality.com/library/otherpublications/sp2002_article2.htm)).

Some paints also have mildew resistance, which also lengthens the lifespan. When applied to aluminum it enhances the look of its newness and it helps prevent chalking and fading. It also adheres well to vinyl siding, but paint should be chosen that is lighter in color than the siding or it will seep through. Other choice surfaces include stucco, brick and concrete. The paint once again helps prevent chalking, fading, and color changes from alkali chemicals.

Latex paint also has many advantages. The fumes are not as strong as other paints and emit less harmful chemicals ([www.acehardware.com/info/index.jsp?categoryId=1269959](http://www.acehardware.com/info/index.jsp?categoryId=1269959)). It requires little more than water for clean-up and is non-flammable. The chemicals in the paint provide a quicker drying process, better gloss, less fading on exteriors, no yellowing on interiors, and less cracking and peeling. It is also easy to apply and touch-up. It is also quite inexpensive, with an average cost around \$20 per gallon. The price drops about one third the normal rate when purchasing recycled latex paints ([www.recycleminnesota.org/Buy%20Recycled/paint\\_3\\_2.html](http://www.recycleminnesota.org/Buy%20Recycled/paint_3_2.html)).

One company that provides recycled paints is Amazon Environmental in Roseville, MN ([www.nvo.com/amazon](http://www.nvo.com/amazon)). The paint quality remains the same, is sold for less, and helps reduce unnecessary harm to the environment. A different company that provides a wide variety of latex paints and readily-available MSDS is Parker Paint ([www.parkerpaint.com/Company.html](http://www.parkerpaint.com/Company.html)). Located in Tacoma, WA, this business was awarded the 2003 City of Destiny Award for Volunteer Services. Travel expenses and energy used to transport the products to Minnesota might outweigh any benefits of placing an order, but the company offers a wide selection for browsing and material data information.

Lime paint is unique when it comes to household paints. It has the ability to capture old charm in a new way. Lime paint is an interior and/or exterior paint. It is a water-based paint and

its ingredients are not hazardous in comparison to the conventional paint. Application of lime paints can create different affects such as a weathered or antique look; to create the weathered look apply one coat of paint. Apply more or less paint to create the desired effect. Lime paint can also have a textured appearance depending on the application technique. Overall, lime paint is popular for its flexibility, durability, and authenticity. Before we dig deeper into lime paints, we should look at its history.

### ***History of Lime Paint***

Lime paint holds its origins in ancient Rome, around the 7th Century B.C. The society originally used the paint to decorate the outside of their homes. As time progressed, the Greeks and Romans came up with a technique of painting with lime called fresco. The invention of paper had yet to be invented therefore, people displayed artwork on walls and ceilings, thus creating frescos. Frescos were painted on walls and ceilings using the colors of the earth mixed with a lime plaster.

However, lime paint reached its peak during the 14th century. Artist Giotto popularized lime paint through his frescos. The people of the Renaissance era were also fans of lime paint, including Michelangelo and Raphael. When the 19th century rolled around the interest in lime paint decreased due to advancements in paints that were fade resistant.

([www.arteconstructo.be/historiek11.htm](http://www.arteconstructo.be/historiek11.htm)) In the past decade, lime became increasingly popular due to its durability and its classic antique affect that it can give to a building or a room.

Originally, lime paints came in earth colored pigments such as yellow and red ochre, natural, and burnt umber. The artificial pigments of the present time developed in the past century; these pigments include variations of red, yellow, and blue oxides.

### ***Lime Paint Ingredients:***

Lime paint ingredients are divided into two categories: 1) organic binders and 2) pigments, fillers and mineral binders.

*Organic Binders:* Bones glue, fish glue, leather glue, flour glue, rice glue, milk casein, egg yolk, egg white, ficus milk, nut oil, olive oil, raw and cooked linen oil, methyl cellulose, acrylic resins, and pine oil.

*Pigments, fillers, and mineral binders:* Hydrated lime, meudon white, earth pigments, calcium carbonate, iron oxides, and titanium oxides. ([www.italianplasters.com/historicalorigins.htm](http://www.italianplasters.com/historicalorigins.htm))

Hydraulic Lime is a key ingredient in lime paint; the process of producing it is essential. The process is the same as it was in the ancient times burning limestone and slaking the resulting oxide. Limestone containing silica, alumina and iron oxides produces hydraulicity. The level of hydraulicity depends on how much calcium carbonate is produced. We looked at several lime paints and the one company that described their process of creating hydraulic lime is St Astier.

**The burning process:** Its methods and the energy used are the determining factors in the quantity of silica that combines with Calcium Oxide (CaO) to form Calcium Silicates (CS) which produce the hydraulic performance of the finished products. Burning takes place in vertical kilns at temperatures not above 1000°C. The fuel is anthracite coal, imported from Wales due to its purity, as it produces the least residuals. Continuous checks are made to measure the efficiency of the efficiency of the burning (CO<sub>2</sub> tests) which are essential to regulate the hydration that follows.

**Hydration (slaking):** The controlled hydration process is so precise that virtually no quick lime (<1%) will be present at the end. The efficiency of the slaking process is such that only a small percentage of the slaked material has to be milled to achieve the desired granulometry (0.09 mm).

As shown below, the amount of potentially damaging components produced is so minute that adverse reactions, leading to materials deterioration, are not possible. " (www.stastier.co.uk)

Composition	CHEMICAL (%)			MINERALOGICAL (%)			
	NHL5	NHL3.5	NHL2	NHL5	NHL3.5	NHL2	
<b>Loss @ Ignition</b>	16	18	20				
<b>Calcimetry (CaO<sub>2</sub>)</b>	10	11	6				
<b>Insoluble</b>	5.6	9.6	8	5.6	9.6	8	
CaO	59	56	63	Free lime Ca(OH) <sub>2</sub>	22	25	58
				Calcium Carbonate CaCO <sub>3</sub> UNBURNT	23	25	13
SiO <sub>2</sub> Combined	15	12	6	Calcium Silicate C2S	43	35	17
				C3A	0.7	0.5	0.4
Al <sub>2</sub> O <sub>3</sub>	1.92	1.66	1.3	C2AS	1.3	1.0	0.8
Fe <sub>2</sub> O <sub>3</sub>	0.57	0.49	0.4	C4AF	0.7	0.5	0.4
SO <sub>3</sub> **	0.41	0.45	0.31	CaSO <sub>4</sub>	0.7	0.8	0.5
<b>MgO</b>	1.01	0.98	0.75	<b>Others</b>			
<b>MnO</b>	0.02	0.01	>0.01	The quantities of these components are so small that their mineralogical presence is too minute to be relevant. Very significant for the alkalis (K <sub>2</sub> O/Na <sub>2</sub> O) which, even in small quantities (1.5/2% as in ordinary cement) can produce ALKALI SILICA reactions.			
<b>TiO<sub>2</sub></b>	0.18	0.16	0.12				
<b>K<sub>2</sub>O</b>	0.21	0.16	0.12				
<b>Na<sub>2</sub>O</b>	0.07	0.06	0.04				

**\*\* The presence of SO<sub>3</sub>, absent in the raw material, is induced by the coal used in burning. The small level of it, however, is harmless. Higher gypsum (CaSO<sub>4</sub>) levels due to additions as in the case of ordinary cement or some other hydraulic binders can cause damage.**

([www.stastier.co.uk](http://www.stastier.co.uk))

With all the ingredients intact, a powder is formed and packaged. Lime paint is water-based; therefore, the powder is mixed with water to form paint. Lime paint has a life span one year in the powder form. Once it is mixed with water the paint has a life span of two years if it is kept in an air tight container.

### ***What makes lime paint different from the average paint?***

Lime paint is environmental; it's made from non-toxic materials. Lime paint should be handled with gloves because it can dry skin out. "Lime Paint is amongst the most environmentally friendly paints available." ([www.limepaint.com](http://www.limepaint.com)) This product is used to repair old buildings without causing any damage. Lime paint ages very well with time. The artwork of Michelangelo still has traces of its original paint. This paint has been and is used to repair historical monuments. In comparison to latex paint, lime paint does not shrink when it dries, and it does not chip easily. Lime is also more breathable than latex paint. There are also variants of lime paint such as vegan and natural lime.

Natural lime paint and lime paint are very similar in many ways. Natural lime paint, along with lime paint, is made from burned limestone. Both lime paint and natural lime paint have low odor and do not off-gas. Both of the paints are colored with pigments. One application difference between the two paints is that it is better to use lime paints indoors where as natural lime paints can be used indoors and outdoors. Natural lime paints have better indoor air quality, so it is safer to be used indoors.

Natural lime paint has been around since the beginning of buildings. The paint has a large range of uses, from houses and cottages to large cathedrals. The paint that was applied back when buildings were constructed still exists today. The paint has quality and it is durable. The paint never changes color or other properties over time.

The paint has many different areas that make it unique. The paint starts out as a powder to which the consumer adds water, in order to make the paint to apply to the wall. When you add another layer of natural lime paint to the previous layer, it strengthens and reactivates the previous layers. With other paints, the previous layers need to be stripped or flaked away, but not

with natural lime paints. The paint does not give off any harmful toxic fumes once it is applied to the wall so it can be used immediately, where as with other paints, you have to wait a certain amount of time before you can use the room. The paint is colored by pigments, many which are naturally occurring.

There are also some advantages of using natural lime paints. Once the paint is applied, it can reflect sunlight. This process allows the area to be cooler. The paint also is an ultraviolet light absorber. This helps with the ozone depletion concern. The paint is a good disinfectant and it has a good resistance against acid rain, which cuts down on maintenance costs and efforts. When the paint is produced, the process does not take much energy to complete. In fact, the production of natural lime paint takes one-fourth of the energy used to produce cement. Therefore, there are less carbon dioxide emissions in the production, making it much safer for the environment. The paint does not contain any toxic products with low levels of sulfur. The paint does not decompose. The paint is easily cleaned up. It can be cleaned up with simple soap and water because the paint is all natural. The paint can also be reused or recycled. One example for a reuse is a use for water purification.

Since the paint starts out as a powder, the most hazardous part of the paint is the dust that can be produced from the powder. The main safety precautions are to not inhale or ingest any part of the paint, protect eyes and skin. Use in ventilated areas. Because the paint is made from all natural products, it does not contain any toxic products and therefore does not give off any emissions.

The paint is colored by pigments, which can create many different colors. The pigments can be “stretched” to make different effects. With other types of paint, many layers are needed to create such color effects. When the natural lime paint is applied, it must be applied with a

brush. Rollers cannot be used. There are places where the paint cannot be applied, such as metal and wood. However, most other surfaces are suitable for the application of natural lime paint. Paint has come a long way. It has progressed through various stages such as non-toxic and vegan. No matter what paint you use, you cannot avoid the good and bad qualities. However, the lime paints, especially natural lime paint, are the ones that are green. Green paints can help our environment in times of need, such as today with the depletion of ozone. The earth has suffered for our actions in the past and now it is time to change them. We can choose to continue with our current ways or we can decide to change tomorrow.

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