

Lime, precious in any case







In pre-historic times, when lime was used by chance to extinguish an outdoor fire, and the pieces of lime decomposed under the flame and in contact to water, they turned into a white powder: our ancestors had produced and diluted lime without knowing it, thus transforming it into calcium hydroxide. Millions of years went by, prior to reach the conclusion that quicklime and calcium hydroxide can be used in endless ways. In our century, the use of this product has become so widespread that, together with carbon, petroleum and iron, it belongs to the group of the most important raw materials used in the production processes of human kind.



# Italcacce

Founded in 1969, ITALCALCE is today one of the most skilled production companies of lime destined to the most advanced and modern applications, and it represents the best Italian tradition in this sector. Equipped with highly technological plants managed by integrated computerised systems, blast furnaces of last generation and top quality production systems, ITALCALCE boasts a production output of over 150,000 tons per year, strictly checked by an innovative chemical-physical analysis laboratory, ISO 9001/2008 certified, that ensures a constant quality level, also guaranteed by the CE marking. The company is located in Terracina, a charming city by the sea, in Lazio, on the Tyrrhenian coasts. Thanks to the enviable strategic position at the centre of Italy, at only 100 kilometres from the port of Naples and 140 kilometres from that of Civitavecchia, ITALCALCE has developed business relations with many international maritime companies.



## Lime

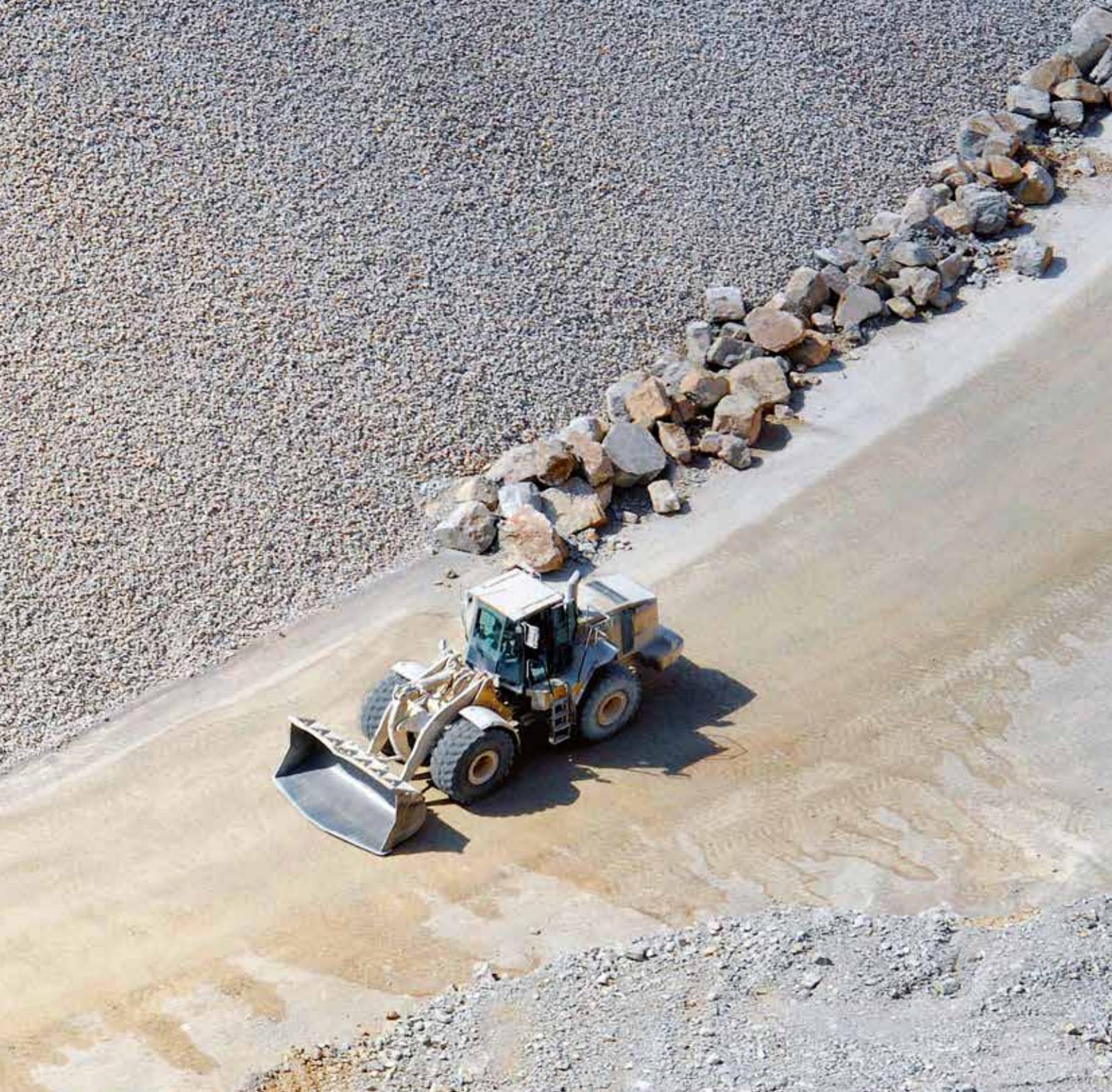
Lime is a material with a natural base, versatile and cost-effective, extremely diffused at global level. Used by iron and steel industries, construction and chemical industries, in agriculture, to treat soils and waste, lime is also used as a natural reactant, through the best technologies, for treating waste, civil and industrial waters, to hygienize biological sludge, to depurate smokes of incinerators and thermo-power plants, and it is certainly the most compatible material with the environment, in terms of costs and benefits.

## The technological cycle

In ITALCALCE, the modern technological cycles are divided in:

- Extraction, processing and screening of the raw material, lime;
- Production and refinement of quicklime in blast furnaces;
- Production of calcium hydroxide, slaked lime and ready-to-use mortar.







# The products

The range of products offered to the market by ITALCALCE includes:

## Calcium oxide in lumps

Calcium oxide, or quicklime, is mainly used in the iron and steel industry. When processing steel and iron, fluidifying the slag, quicklime contributes to remove impurities like sulphur and phosphorous. Another important and essential use consists in the production of sugar, where the task of lime is to separate, through alkanisation, organic acids and albumins from the juice of beetroots and sugar canes.

## Micronized calcium oxide

Micronized calcium oxide is a product obtained from grinding lump quicklime. Its use is essential for those applications linked to the stabilization of soils, decrease of sulphur emissions from thermal power plants, and for the production of calcium-silicate and calcium-sandy bricks. The finished product, of white colour and porous texture, is sold in bulk or in big bags.

## Granular calcium oxide for agricultural use

Granular calcium oxide is an essential calcium and magnesium compound in agriculture. It neutralises the acid reactions of soils and favours softness. It is also used as natural manure to boost the growth of vegetation and as substance to improve the quality and properties of the soil.

## Calcium hydroxide

Calcium hydroxide, or hydrated lime, is a product of superior quality. In construction, mixed with pozzolana or calcareous sands, it produces mortars and plasters, and it is used for the construction of various works and depuration of waters. It is also used to reduce the acidity of smokes in thermal power plants and in incinerators of solid urban waste, as well as in the filtering systems of glassworks. Our product, with its high content of  $\text{Ca}(\text{OH})_2$ , perfectly fulfils the needs to protect the environment.

## Slaked lime (lime putty)

Slaked lime is an excellent hydraulic binding agent for the preparation of coats and finishes on plasters; it is left to settle for over 12/16 months and used for the production of paints, restoration of archaeological buildings and recovery of ancient monuments. A suitable mixing with marble powder or micronized limestone confers outstanding plasticity and breathability to the coat.

## Fine mortar

The wet fine mortar is a finishing plaster made up exclusively of natural materials such as lime putty and fine grain silica sand. It is used for interior finishing of walls that have the traditional plaster or the premix. For outdoor applications it is advisable to add 6-8% of cement.



Materials and  
construction  
industry



# Construction industry

## Building materials

The first signs of the use of lime in constructions date back to 2000 B.C., in southern Galilee, from the Egyptians to Romans and Phoenicians until the Chinese, that used it for building the Great Wall of China.

- **Calcium hydroxide**, or **hydrated lime**, is a building material obtained by mixing calcium oxide with water in technologically advanced plants. Hydrated lime, mixed with calcareous materials, like sands of various granulometries, or pozzolana - a type of sand rich of silica - or finely ground tuff, with the addition of water produces mortars and plasters for buildings' interiors and exteriors.

ITALCALCE's products confer *naturalness*, *healthiness* and *breathability* to the walls of residential buildings, schools and offices, places in which it is essential to live in a *breathable* environment.

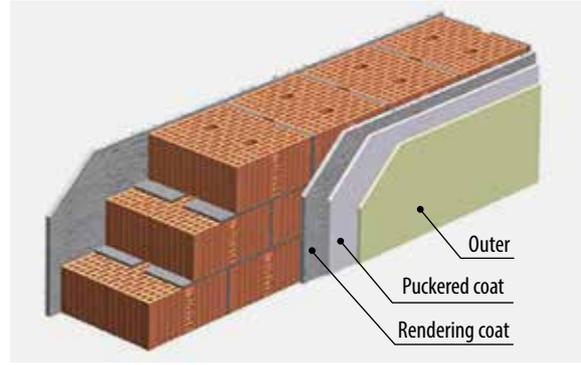
These products, in addition to allow the perfect evaporation and permeability to vapour in order to avoid the formation of moulds and condensates, respond to temperature differences and lead to an extraordinary result: *durability*.



- Finely ground **calcium oxide** is also used in construction, even if indirectly, as basic product for the production of calcium-silicate bricks and calcium-sandy bricks, which are masonry blocks of various thicknesses and low specific weight.

- **Lime putty** is a paste of pure white colour, produced after diluting pure calcium oxide with plenty of water. It is left to settle in tanks/silos for 12 months and then, mixed with extremely fine calcareous sands without chemical additives, it is used for coating interiors or any type of plaster; it is a plastic and breathable finish, it is ecological and extremely resistant to moulds and bacteria. Its use is also valuable in producing paints, *venetian stuccos* and *spatolated*, architectural colours and high quality finishes.





The plaster for exterior and interior use is composed of three layers: **rendering coat**, **puckered coat** and **outer** or **civil coat**; it is prepared in dry form, mixing quarry or marble sand with one or more binders, then lime and cement in the right proportions, finally adding water so as to obtain a sufficiently firm mixture.



The first layer, the **rendering coat**, has a thickness of 15 -20mm using coarse sand; it is applied in place with a trowel, creating a homogeneous and rough surface. The **puckering coat** is made to a thickness of 10 - 12mm using medium-grain sand, waiting until the first coat is sufficiently dry.



Finally, the **outer** or **civil coat**, with a thickness of 2-4 mm using fine sand, is the finishing layer of the plaster. The use of lime in the plaster is essential as it allows the masonry to breathe and evaporate the moisture contained therein.





**Slaked lime** is a plaster of high breathability for interior use that makes it possible to obtain a highly prized, glossy spatula-formed decorative finish, with hues of mellowed colour shades and depth of texture that vary depending on the application technique and the added colouring materials.



It is primarily used for smoothing onto the **finishing plaster** when special finishes are desired, such as for stuccos, ground marble plasters or textures typical of classic period decorations. Slaked lime is also used in the restoration of antique stuccos and luxury finishes.



On seasoned plasters, dry and free of dust, at least two layers of product must be laid first to prepare the base thoroughly; then small amounts are applied with a metal spatula or a stainless steel trowel, overlapping the passes to achieve the flecked/dappled effect and the special transparency and chiaroscuro desired.



## Road constructions

The construction of roads, railways, airports and channels requires every year the availability of many millions of cubic metres of inert materials, and it is renowned that these materials are hard to find and bear high costs. Lime offers the possibility to recover, for this use, various types of soils which are usually deemed unsuitable.

Slimy-clayey soils, sands and gravels with significant clayey components, as well as pozzolanic sands altered with extremely fine substances, by mixing a lime percentage become excellent materials for foundations, rises and road superstructures.

The application of micronized calcium oxide in clayey soils aims at improving the mechanical properties of the soil, such as for example humidity, classification, plasticity, bulk density, mechanical resistance and resistance to frost.

## Soil stabilization

The use of lime to stabilize soils was already known to the Romans, Tibetans and Chinese.

Micronized calcium oxide is used to:

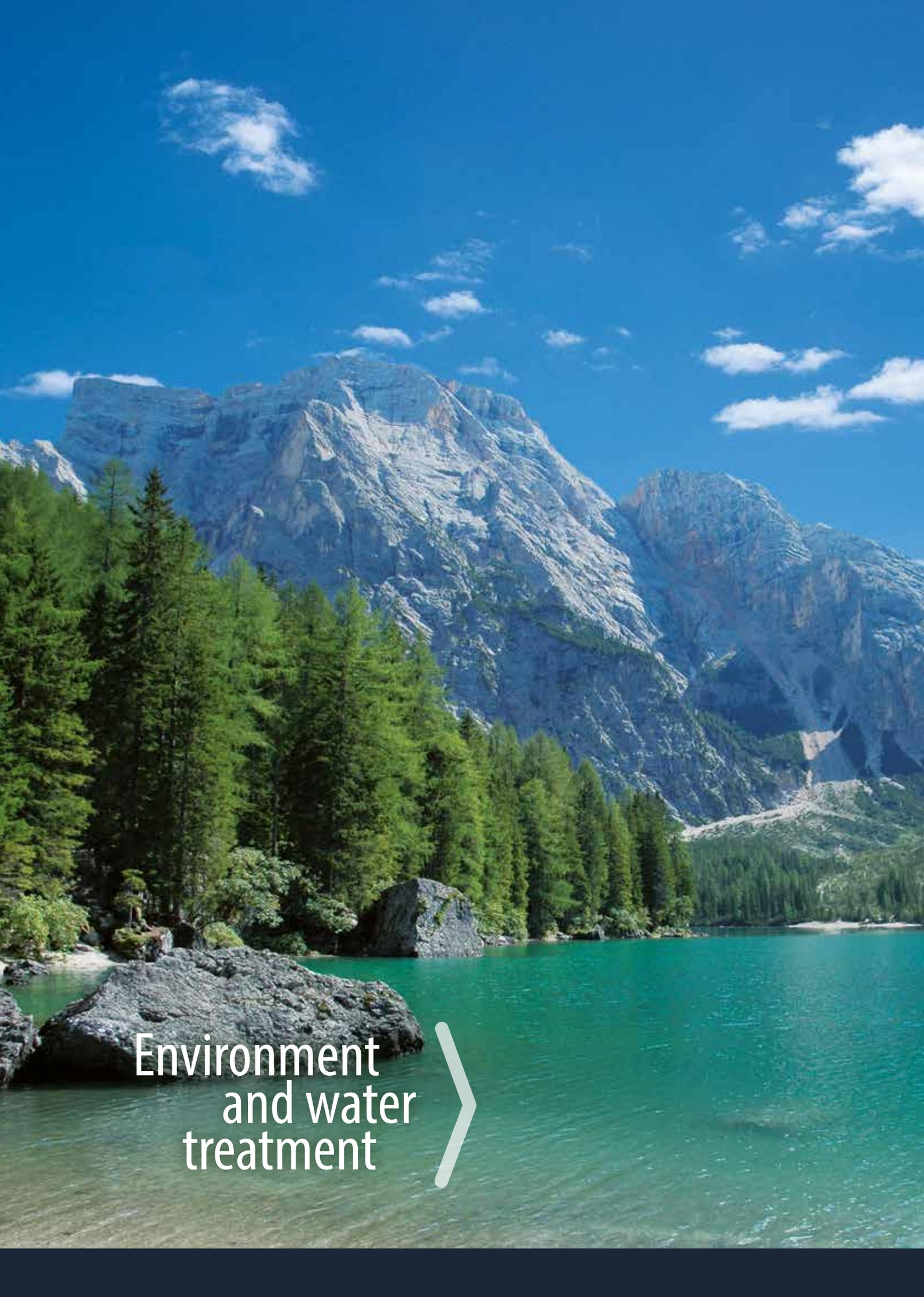
- Improve existing soils to build temporary transport roads and construction areas;
- Stabilize simple forestal and agricultural roads;
- Stabilize road foundations for high performance roads;
- Build airport runways, parking lots and railway tracks.

Adding hydrated lime as mineral filling powder in the hot asphalt mixes used for the construction of roads, airports and other areas subject to traffic increases the stability and elastic resistance of the asphalted road surface, even by 50% and, at the same time, it improves drainage. Moreover, the binding qualities of binding agents with inert materials are improved, as well as the mixability of the compound.

- The reclamation of contaminated soils constitutes an environmental problem at global level.

Also in this sphere, the soil stabilization through lime – but with the intent to reduce the potential hazard by converting the contaminants and through the chemical-physical transformation of the soil – is a process in which the use of micronized quicklime is extremely effective.





Environment  
and water  
treatment



# Water treatment

A **clean world** has been ITALCALCE's mission since its foundation, and this has led the company to achieve a renowned position also in the remarkably important water treatment sector.

The availability of fresh spring water required to satisfy the needs of human kind is constantly decreasing, and industrial waste and pollution are contributing to quickly deplete our water resources. But, fortunately, new technological discoveries and efforts, aimed at the maximum respect for the environment, contribute to avoid this risk: through lime, the soil can restore its fertility, the rivers can restore their limpidity, and the water can become clean once again, thus replenishing the availability of fresh water.

## Decarbonisation, neutralization and remineralization

Decarbonisation, neutralization and remineralization are among the main fields of use of lime, in the form of aqueous suspension, for treating waters.

As an essential chemical agent in treating waters for human use, lime is useful to:

- correct the total hardness in waters rich of calcium salts and magnesium dissolved in various quantities, combining with one another and blocking, at the same time, the aggressive action of calcium carbonate, which causes the formation of limestone deposits in pipes;
- neutralize waters to a neutral pH, by reducing excessive free carbon dioxide;
- remineralize waters which are poor in bicarbonates, re-integrating the calcium ion.

Free of heavy metals and potentially harmful chemical substances for men, ITALCALCE's hydrated lime is particularly suitable for the general water purification process and, more in particular, for the important **desalination** process of sea water. For over ten years, ITALCALCE has been supplying highly pure calcium hydroxide to the Republic of Malta for its desalination systems, useful to provide the necessary quantity of potable water to the entire island.





# Depuration of waste water

Calcium hydroxide, with a very high content (> 94%) of  $\text{Ca}(\text{OH})_2$  and fineness between 0 - 90 micron, is used, in the ecology sector, in chemical-physical treatments concerning depuration systems of industrial and domestic waste water, under the form of lime water or limewash, to avoid pollution in water streams. Its characteristics of main chemical reactant ensure the required reliability and cost-effectiveness for the safe reutilisation of depurated water. Its ability to correct pH, to generate precipitation of sulphates, phosphates and fluorides, together to the ability to neutralize acid waste and reduce the polluting soil load, render lime the most reliable and cost-effective solution to treat waste water. Since 1990, ITALCALCE has been the supplier of hydrated lime for numerous public and private companies that use it in the first disposal phase of industrial waste waters.



## Sludge

The biological treatment of waste water obviously produces a sedimented sludge residue that, once treated and hygienized, can be effectively used in agriculture, being a precious source of fertilizing elements. During the hygienization phase of the sludge, the addition of lime to the basic material favours the dehydration of the sludge, reduces the pathogens present, stabilizes the degradable components and eliminates unpleasant odours.





Forest and  
agricultural  
economics



# Agricultural economics

## Plants' nourishment

In agriculture, calcium oxide is used as sterilizer and neutraliser of soils' acidity, often caused by various and complex phenomena. The soil's acidity excess has a remarkable influence on the development of crops; on the other hand, the addition of lime favours the perfect assimilation of the main nutritive substances.

**Calcium** is useful in the plants' physiology because it acts in the:

- cellular relaxation and division processes;
- resistance of tissues and formation of pollen;
- development of the roots.

**Magnesium**, instead, acts in the:

- composition of the chlorophyll molecule;
- mechanisms that prevent water drop.

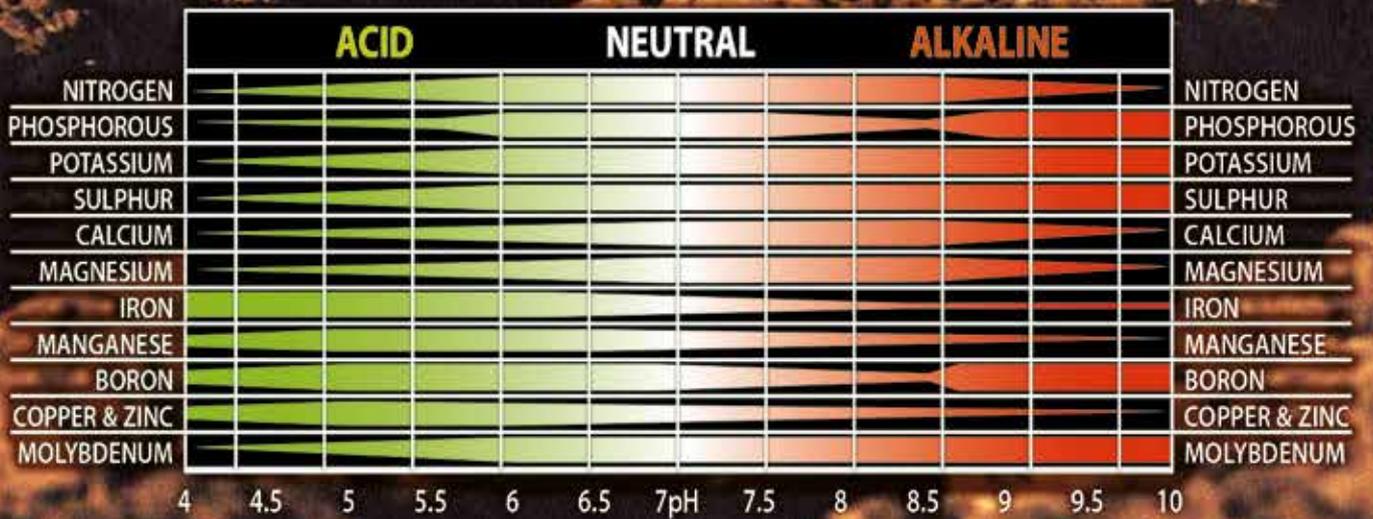
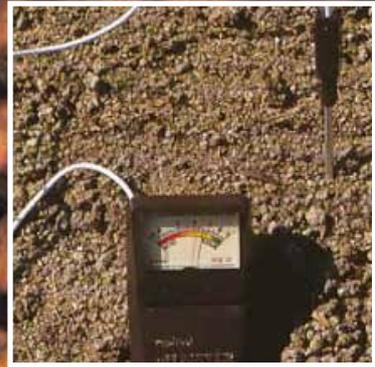
## Structure of the soil

The presence of lime in the soil has a positive influence also on the physical and mechanical properties of it, facilitating the structural aggregation phenomena, improving permeability to water and allowing to bring the pH value close to the neutral value, that is pH 7. In most cases an adequate treatment of the soil with lime determines a valuable increase in crop production, and the value of this increase highly exceeds the cost of manure and its laying.

## Growth of micro-organisms

The biological conditions for the presence of useful micro-organisms are present only in soils rich of lime. Therefore, the addition of lime in soils influences the growth of bacteria and formation of nitrate, which can be seen from the quick increase of CO<sub>2</sub> formation, nitrogen content and formation of enzymes. The grain structure of the soil is favoured by annelids, in particular worms, whose galleries favour water distribution by deviating excess rain water in the sub-soil.





## Phenomena caused by lime depletion

In all agricultural soils lime is depleted due to erosion and constant harvests.

If these lacks are not compensated, phenomena caused by lime depletion will occur in a short period of time, mainly at the beginning of the growth period, when there is the maximum absorption of nutritive substances.

In light soils said phenomena occur first of all as acid damages, while in uniform soils as structural damages.

## Lime additions

Lime depletions are not only due to the aforementioned causes, but also to specific mineral manures, that boost the acidity in the soil.

Therefore, prior to carry out the process of manuring, the soil must be carefully evaluated.

To create or preserve favourable growth conditions for useful plants, lime depletions must be quickly re-integrated.

The quicklime required for manuring must be used in granules of 2-6 mm, since this format is more soluble and therefore it reacts quicker.

The manuring period with quicklime is not strictly related to a specific time, but spreading the product prior to the vegetation period, in mid spring, improves the soil's structure significantly.

Other lime applications in agriculture are: use of limewash or lime water to disinfect cellars and stables after adding pesticides; paint the trunks of orchards to protect the plants from sun rays during the summer and from frost during the winter, and to increase protection against the aggression of parasites; favour decomposition and disinfection of carcasses, in addition to recover and reclaim contaminated soils.

**ITALCALCE has improved its systems to produce granular lime of 2-6 mm, characterised by a total lack of powder that makes it suitable for spreading for agricultural use, also during windy days.**





Iron, steel  
and chemical  
industry



# Iron and steel industry

Iron and steel industry is the main consumer of quicklime.

Many millions of tons of iron and steel are produced in Italy every year, and the use of the calcium oxide with low granulometry and controlled reactivity is essential for this purpose.

In this industrial sector lime is used in most metallurgical reactions, whose purpose is simply to combine, in the slag, the secondary elements to eliminate, i.e. sulphur and phosphorous.

Sulphur is introduced in primary smelting cast iron, mainly through the coke, used in the blast furnace as fuel and reducing substance, while steel is introduced through almost all charge stocks, differently from phosphorous which is already present in the same mineral.

Due to the harmful action of sulphur and phosphorous on the metal properties, these must be reduced as much as possible, also in the use of high quality lime. And the calcium oxide produced by ITALCALCE perfectly satisfies this need.



## Non ferrous materials

Lime is extensively used for the treatment and recovery of non-ferrous metallic minerals. In the flotation of the copper mineral, the lime used as additive acts as reducing substance and contributes to maintain the proper degree of alkalinity.

In extracting gold and silver with the flotation process of cyanide, quicklime is used to control the pH value. Moreover, it is used in the flotation processes of lead, zinc and molybdenum.

In South Africa, the uranium industry represents a great source of consumption of quicklime, which is mainly used in flotation processes from residues of gold mines.

In conclusion, quicklime is used as a fluidifying agent in the production of iron-chrome, iron-manganese, nickel, tin, titanium and other metals.



# Chemical industry

Lime, as the most affordable basic material available on the market, is used: in the chemical industry for the production of combinations between organic and inorganic calcium; as adjuvant of the reaction in chemical syntheses; to alter the pH; in chemical decompositions or physical-chemical preparation processes. In the latter case, lime causes the sedimentation of many impurities and reaction products in a colloidal solution that forms insoluble combinations with  $\text{Ca}^{++}$  or  $\text{OH}^-$  ions. In most cases, micronized calcium oxide or highly pure calcium hydroxide is used in the chemical industry for the following main purposes:

## Inorganic chemistry

- Production of calcium carbide and calcium cyanamide;
- Production of soda and potash;
- Production of calcium oxychloride and calcium chloride;
- Production of calcium precipitate and calcium salts;
- Production of glass.

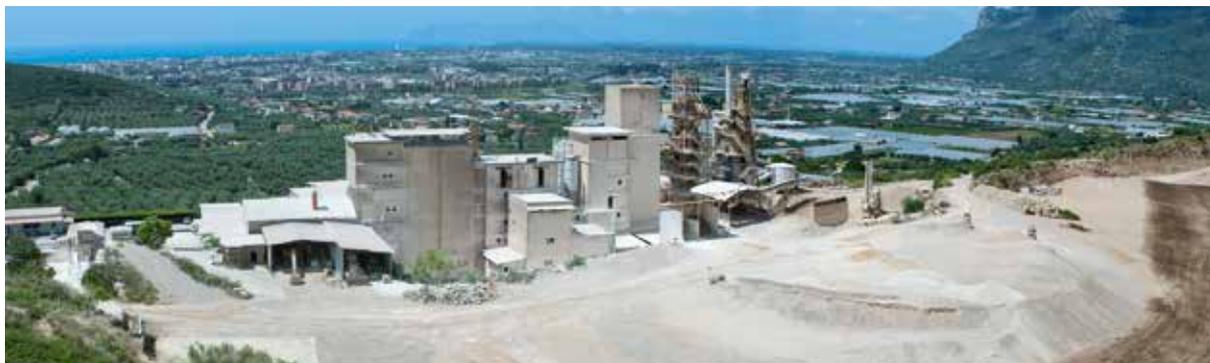
## Organic chemistry

- Production of ethylene and propylene oxides;
- Production of glycerine and polyvalent organic acids;
- Production of leather, food products and sugar.

In leather industry, lime is requested in form of calcium hydrate suspension for depilation, and for the calcination of leathers.

In food industry, lime is used in the churning of milk to decrease its acidity, in the processing of residues from citrus fruits and grape, and in preserving apples and pre-packaged foods. In the industrial extraction of raw sugar, lime is an essential element, regardless if the starting base is cane or beetroot. From the juice obtained through squeezing or diffusion, lime separates the sugar content from unwanted concomitant substances.





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