LIME System





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ABOUT US



HISTORY

Fassa Bortolo has its origins in lime, a raw material that is part of the company's DNA. The construction of the first lime kilns marked the beginning of a success story that has continued to the current day, reaching new qualitative heights in terms of research, innovation, technology and care for the environment.

Today the Fassa Group is the only company to produce all types of lime: calcitic lime, magnesium lime, dolomitic lime and NHL 3.5 natural hydraulic lime.

A HISTORY OF INNOVATION SINCE 1710

Fassa Bortolo's history dates all the way back to 1710, yet it is in an old factory from the early 1900s, the former Opificio Lazzaris in Spresiano (Treviso, IT) and currently home to management offices, where our industrial vision began, leading to a series of major expansion projects on national and international markets. An important site where ideas continuously come to fruition, a sort of incubator that promotes and supports competitive challenges.

Development ideas that continue to lay new foundations for a dynamic and extensive presence, always close to the customer.

Ideas of progress whose strategic foundation lies in the skills of the people who run the company today, and those who are preparing to accompany it in the future. A strategically-located presence, with "zero mile" products and special attention to sustainability, reducing pollution from transport and limiting the amount of exhaust gases and tyre rubber in the environment. To continue to offer that superior quality demanded by today's market.

Buying our lime means buying one of the key raw materials in our products: our Lime Division sells the same lime that we use for the production of Fassa Group products for the construction industry.

LIME PRODUCTION SITES

The Fassa Group currently has 16 sites in Italy, one site in Portugal, one in Spain and one in Brazil, and 9 sales offices located in Italy, Switzerland, France, Spain and the United Kingdom.

In addition to the two main sites that have long been producing lime (Spresiano, in the province of Treviso, the company's historic site and Montichiari, in the province of Brescia), there are two other production sites in Ceraino di Dolcè (in the province of Verona) and Schio (in the province of Vicenza).

As a result of these acquisitions, the company has strengthened its role in the sector and has become the second largest lime producer in Italy.

These sites use a special Parallel-Flow Regenerative Kiln (PFRK), the least energyconsuming kiln in use on the market. This is a practical demonstration of the company's focus on its production impact on the environment and on the local territory in which it operates.

19 production plants of which

4 produce air lime:

O Spresiano (Treviso) plant

2 Montichiari (Brescia) plant

3 Ceraino di Dolcè (Verona) plant

Schio (Vicenza) plant



ĺ

4

commercial branches



SPRESIANO (TREVISO) Plant

The Group's first and most important plant dates back to 1981 and is it here that the company's growth and expansion at national and international level began.

Tradition and innovation coexist perfectly at the Spresiano production site, in Treviso province, where two technologically advanced and highly automated plants are in operation for the production of lime and premixed products.

Calcination occurs in a Maerz regenerative kiln with a production capacity of 300 tonnes of calcium oxide per day. Lime produced in this site is very high quality, due to the purity of the limestone and plant efficiency.





LIME

MONTICHIARI (BRESCIA) Plant

This plant is dedicated solely to the production of lump lime, hydrated lime and aerated calcium oxide, and is equipped with next generation technologies and two Maerz parallel-flow regenerative kilns resulting in a total production capacity of 1,000 tonnes per day. In addition to recent enlargements and the construction of a plant for the production of dolomitic mixtures, the latest development in the steel industry, the site is subject to strict quality controls and constant focus on product innovation in order to meet even the most exacting demands.



CERAINO DI DOLCÈ (Verona) plant

The site was acquired by Fassa S.r.l. in 2017 and has two Maerz regenerative kilns for a daily production capacity of 700 tonnes.

Another vital element is the presence of a very pure limestone quarry near the site.

After the acquisition, the site underwent a major revamping, which has delivered excellent results in terms of circular economy, lowering the environmental footprint and strengthening supply chain sustainability: from improving noise and visual impact, organising rainwater collection in line with the best available technologies, to changing fuel from pet coke to wood powder. In fact, the site has switched to using wood processing waste as fuel, thus minimising CO_2 emissions from fossil fuels during production.

SCHIO (VICENZA) Plant

Acquired in March 2017 and today subject to the management and coordination of Fassa S.r.l., the Calce Barattoni S.p.A. plant is dedicated to the production of dolomitic lime. The raw material is fired in a CIM kiln with a production capacity of 400 tonnes per day. Built in 2000, the plant was converted into a double-shaft regenerative kiln for dolomitic lime production in 2013.



R&D: FASSA I-LAB



Our research is focused on producing quality. We identify the most technologically-innovative solutions in order to expand the horizons of our products. Investing in research is essential for any company that wants to constantly improve its performance.

This is why we have our own Research Centre, Fassa I-Lab, a state-of-the-art laboratory with a wide range of equipment and apparatus, continuously updated to meet the latest regulatory and market requirements and the customers' needs for new solutions.





electron microscopy and laser particle analysis are used to analyse materials at a microscopic level and identify their chemical-physical properties, so as to be able to select the formulations that best certify the quality of our products, and predict, using specific tests, their behaviour in a variety of environmental conditions.

Our daily focus on research has also resulted in our

company obtaining ISO 9001:2015 certification. This is, for us, further confirmation of the superior quality we offer the building industry in this area so that we always deliver excellence.

In this strategic location, we process information from the market and translate it into solutions that are developed and certified before being marketed.



SERVICES



CONTACT US ON THE WEBSITE SISTEMACALCE.FASSABORTOLO.IT/EN

KNOW-HOW AND SERVICES FOR A FULLY COMPREHENSIVE PARTNERSHIP

Fassa Bortolo products are the result of experience in the field and continuous research aimed at creating tailormade solutions based on the specific production cycle and customer needs.

The guarantee of a very high quality product is combined with constant assistance, both from a technical and logistics point of view, provided by a team of experts and specialist technicians offering comprehensive service and constant support.

With its broad range of services, Fassa Bortolo is able to meet the increasingly diverse needs of its customers.



What can Fassa Bortolo offer? CUSTOMISED PRODUCTS

Having direct control over the supply chain, thanks to the quarry it owns, and being a primary producer, Fassa Bortolo is able to customise the product according to the customer's technical requirements, whether physical or chemical. As a result of many years of experience in supplying lime to very different markets and applications, our specialist technicians can create customised products suitable for any need.



SOLUTIONS FOR PRODUCT STORAGE AND DOSING

With the expertise it has developed in the building industry, Fassa Bortolo has also created, for the Lime Division, systems for storing and dosing pulverized and pebble air lime. These systems are suitable both for production needs as well as for non-routine or routine maintenance directly in the customer's plant, thus enabling operational continuity. Given the nature of the material, it is important to ensure that the properties of the raw material are not compromised: this is why our range of silos has been designed to ensure that finished product quality is maintained.

Lastly, we offer the opportunity to use our range of unloading systems for transferring air lime from the silo to final use: from screw conveyor to pneumatic transport with our conveying systems.

LIME





DEVELOPMENT OF CUSTOMISED EQUIPMENT

With a view to improving the service provided to the customer, Fassa Bortolo assesses the construction of customised systems and/or special projects for the lime product. A joint study with the customer, consisting of site inspections and feasibility studies, is followed by a design stage where the technical requirements are combined with the solutions available within the budget.



DRAFTING OF SPECIFIC TECHNICAL REPORTS

When requested by the customer, our technicians can carry out a technical inspection of the plant in order to propose the best solution that meets the requirements. The Lime Division can count on both plant and product solutions: our technicians can propose the leasing/sale of equipment for lime storage and dosing and, at the same time, identify the product that is best suited to the customer's plant conditions and the most efficient for the type of process selected.



ANALYSIS OF MATERIALS

Leveraging on the experience of our technicians and the equipment in our Fassa I-Lab, we are able to analyse products in a variety of ways:

- mineralogical and crystallographic analyses using an X-ray diffractometer (XRD);
- compositional analyses using an XRF spectrophotometer and an optical emission spectrometer (ICP-OES);
- analyses of porosity and surface area using a gas porosimeter;
- surface analyses (including compositional) using a scanning electron microscope (SEM);
- reactivity analyses using appropriate equipment (as per EN 459 standard);
- analyses of grain size using mechanical screening and laser granulometer.

TRANSPORT

Our logistic services is designed to meet customer needs with a focus on swift and efficient delivery. We understand the importance of timely and secure deliveries, and our dedicated team is committed to ensuring items reach their destination promptly and in pristine condition.

SUSTAINABILITY AND THE ENVIRONMENT

LIME: A NATURAL MATERIAL, The element of life

Lime is life. And today, lime production still represents an important investment project for Fassa Bortolo, allowing the company to meet the many industrial applications of the lime market, such as the steel industry, construction, ecology, agriculture, etc.

To guarantee excellence in every field of application, lime is subjected constantly to the strictest controls, from the meticulous selection of the purest part of the raw material to the constant monitoring throughout the lime production cycle from the quarry to the end customer.

All our kilns use biomass as fuel. This, combined with the burning method developed by our technicians, enables us to produce calcitic and dolomitic lime of high purity and reactivity.





LIME

THE PRODUCTION PROCESS: From Extraction to the END product

LIME



OUR QUARRIES

In our opencast quarries, we only use the most advanced quarrying technology. Meaning we care for the local territory and the environment, as well as the health of our workers. Currently, we directly operate limestone quarries using techniques based on a strategy of environmental remediation and reuse of the quarry area at the end of its operation. Our philosophy is simple: everything like it was before. This is why we have developed a very strict "quarrying culture" aimed at ensuring total respect for surrounding nature.

Our quarrying operations are designed to ensure equilibrium in terms of geomorphology, hydrogeology and the landscape, and consequently minimise the impact on the local environment. Moreover, we constantly measure the dust and noise produced during processing, so as to ensure quality of both the working and outdoor environment at all times. The best possible environmental remediation needs to be planned when designing the quarry and needs to be contextual to its management. In other words, the quarry needs to be managed with its final remediation already defined. Indeed, carrying out environmental remediation simultaneously with the extraction operations offers the chance to monitor in a timely manner the actual results of the remediation work and whether this meets the forecasts.

When designing a quarrying operation, the needs of the local territory have to be considered, ensuring environmental compatibility of operations at all stages. Careful design is therefore a prerequisite for mitigating the environmental impact on the landscape, flora and fauna, and to allow for appropriate environmental remediation of the area at the end of operations. It is essential to manage quarrying operations with techniques that are conceived with environmental remediation and reuse of the quarry area at the end of operations already in mind. Remediation does not necessarily mean restoring the area to its original conditions, rather is aimed at redeveloping the area in order to make it available for public use (educational, scientific, naturalistic or sports purposes) or for other uses, yet with the focus always on sustainable development. Our opencast quarries are worked progressively downwards in horizontal levels, with each level being immediately remediated once the material has been extracted. Our quarries with underground crushing of the stone also involve less use of transport vehicles; the quarried material falls by gravity through a raise into the storage area, thus solving the problem of the height difference between quarry face and storage area. The raise is connected to the outside by a tunnel, where the primary crushing system is located. Conveyor belts then carry the mineral to the storage areas at the exit of the tunnel, where final processing is carried out.

QUARRY REPORT BY LEGAMBIENTE

Legambiente periodically conducts research to uncover data on the economic and environmental impacts of quarrying in Italy. The aim is to tackle challenges and seize opportunities from a circular economy perspective.

Fassa Bortolo has been selected as an example of good practice in extraction operations because it carries out the activities needed to achieve the best environmental remediation in all its quarries and plans these activities from the design phase of the quarries themselves.



CAVE

"Fassa Bortolo has acquired over twenty years of experience in operating limestone quarries, managing several different types of activities. The quarries with underground crushing chamber are the most efficient for a rational exploitation of mineral deposits with a limited impact on the surrounding environment. In this case, the vertical height between quarry working face and storage area is joined by a raise located centrally in relation to the extraction operations. A tunnel then connects the crushing chamber to the outside, where the limestone is transported on conveyor belts for further crushing, screening and finished product storage. The extracted material is mainly used for the production of premixed renders, lime and other building products" (2021 Quarry report – Legambiente).

↓ Download the "2021 Quarry Report"





BEST PRACTICE: THE Former "Gessi" Quarry in Moncalvo (Asti)

One of the examples of **good extraction practice and area restoration** cited by Legambiente is the **former "Gessi" quarry in Moncalvo (AT)**, acquired by Fassa Bortolo in 2000. The quarry, previously opencast and exploited by other activities, has undergone major environmental remediation. Today, the area appears completely re-landscaped and reveals a gentle morphology with widespread, uniform grass cover over the entire surface. The **planting of trees and bushes** in 2016 contributed to the **vegetation recovery** process and has established vegetation similar to that of the surrounding hills.

Google Earth view of the quarry in 2006 – 2011 – 2016 – 2019



THE PHASES OF LIME PRODUCTION: EXTRACTION, CRUSHING AND SCREENING

The lime cycle is crucial to the many applications of this material and enables the limestone extracted from quarries to be converted into a family of heterogeneous products that include calcitic quicklime, hydrated lime and dolomitic quicklime.

We have made a video that explains the different stages of lime production.

↓ Watch the video







LIME

THE QUARRY: EXTRACTION OF THE RAW MATERIAL - LIMESTONE

Lime production starts with extracting limestone from quarries and mines. Lime is composed of limestone containing high levels of calcium carbonate and/ or magnesium and/or dolomite (calcium magnesium carbonate), together with other minerals. Most limestone used for the production of lime is extracted from opencast quarries because, in many major lime production areas, limestone deposits are found in horizontal or only slightly sloping layers, which are usually easily accessible.



CRUSHING

Once extracted, the limestone is transported to the crushing plants equipped with jaw crushers. A series of conveyor belts transport the material from the crusher to the screening machine and from the latter to the various storage points. Depending on the size required for the next processing stages, the limestone can be subjected to a second screening; stones processed in this way will range in size from about 100 mm in diameter to grains the size of powder (<3 mm in diameter). After the specific sized pieces are washed, the material is sent to the kiln.



CALCINATION

The lime production process consists in burning the calcium carbonate or calcium magnesium carbonate at temperatures of up to 1100°C to release the carbon dioxide and obtain the oxide produced from the following reaction: CaCO₃ \rightarrow CaO + CO₂

The calcium oxide exiting the kiln is generally separated, crushed and/or ground before being transported to the storage silos or is transported to the hydration plant in order to obtain hydrated lime. The calcination process occurs in double-shaft lime kilns which, simply put, can be represented as two vertical interconnected cylinders where the kiln gases leave the burning shaft through the limestone charge and flow through the connective channel to the limestone charge in the second shaft. The process occurs in sequence, thus obtaining excellent energy efficiency.





Maerz kiln



Shaft of Maerz kiln

The heat transfer inside each shaft can be divided into 3 main stages:

PREHEATING Zone

Corresponds to the highest part of the two shafts of the kiln. The hot off-gases leave the burning shaft, pass through the preheating shaft and transfer heat to the freshly supplied limestone fill, before leaving the kiln to be treated by special filters.

CALCINATION Zone

Corresponds to the central area of the kiln. Fuel is fed through lances which are arranged evenly across the whole section of the shaft and at the lower end of the lance the fuel meets the combustion air and is ignited. This is where the preheating zone ends and the burning zone begins.

COOLING ZONE

The quicklime that leaves the calcination zone is cooled by direct contact with the "cooling" air, before exiting the kiln from the bottom.

The heating process is alternated intermittently between the two shafts usually 5 to 10 instances per hour, optimising heat recovery and making the process more efficient. These types of kilns produce a soft-burned lime with high reactivity. The burning process described above is not immediate; the duration depends on multiple factors but generally lasts between 20 and 48 hours.

The lime discharged from the kiln then undergoes a screening process to supply customers with the size required for their production processes:

Pebble lime

Pebble lime is sold to steel mills, environmental companies and the chemical industry and is in turn used to produce hydrated lime.

Micronised material

Part of the material is ground to extremely fine grains, thus obtaining a micronised material that is suitable for the customer's needs.

Hydrated lime

Quicklime is fed to a hydrator where it reacts in contact with water and develops heat, turning into a very fine white powder called hydrated lime. This fine powder is mainly used for the flue gas treatment, biological sludge, water and wastewater.

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THE LIME CYCLE: CARBONATATION

Carbonatation is the process that occurs during application, when lime is exposed to air and hardens and, as it loses water, absorbs CO_2 , therefore offsetting part of the CO_2 emitted during production.

A study commissioned to the Milan Polytechnic University the European Lime Association, of which Fassa is an active member, found that approximately 33% of the CO_2 emitted during lime production could be captured by carbonatation during the various applications; this could reach 40% with the use of special techniques.

Studies defining the role of lime in the removal and permanent storage of CO_2 open up interesting perspectives and may give the European lime industry a new role in the European campaign to achieve carbon neutrality by 2050.

The lime cycle reveals an ancient material with unique properties. The raw material used to produce lime is calcitic or dolomitic limestone, $CaCO_3$ and $CaMg(CO_3)_2$ respectively, the result of the precipitation of calcium carbonate in crystal clear water. Precipitation of this type of mineral can take place in water directly or through living organisms such as algae, corals and molluscs. Although limestones are very similar to the human eye, they are

actually highly variable and complex, precisely because of their formation.

The most pure carbonates – once extracted, crushed and screened – are fed into lime kilns. Here, the heat provided by the biomass fuels used by Fassa Bortolo releases the CO₂ present in the limestone in the form of carbonate, thus transforming the raw material into quicklime or calcium oxide (CaO). This type of oxide is highly reactive to water. Once in contact with water, it transforms into calcium hydroxide Ca(OH)₂ – hydrated lime. This hydration reaction is rapid and releases heat. Once this mineralogical composition is achieved, when immersed in an aqueous solution, lime can easily carbonate by absorbing the CO₂ in the atmosphere to re-form calcium carbonate, the raw material in lime production, thus closing its cycle. This behaviour is the basis for the action of lime putties and frescoes. Many masterpieces have survived to the present day precisely because of this reaction.



ENVIRONMENTAL PRODUCT Declaration (EPD)



In keeping with the company's green vision, a Life Cycle Assessment (LCA) was carried out for the lime. This LCA enables the life cycle of the products to be studied objectively, from production of the raw materials to delivery of the products to the customer.

LCA is a standardised method that evaluates the impact of a product on the environment, analysing its life cycle as a whole or only parts of it. The calculation includes the stages of preparation, production and distribution as well as the endof-life phase of any packaging used.

Based on this assessment, the Environmental Product Declaration (EPD) has been prepared for Calcitic lime and Dolomitic lime that reports environmental impacts in a credible, transparent and comparable way, based on the LCA.

The carbon footprint represents a subset of LCA data and

CO₂ production is one of the most important categories.

The assessment conducted made it possible to compare and measure the environmental impact generated by the various different production processes, measuring this in kg of CO₂ equivalent so as to identify the activities with the highest impact, demonstrate environmental performance as objectively as possible, offset the amount of CO₂ produced and try to reduce emissions at the source.

Our company has decided to adopt a certified EPD Process system in order to prepare EPDs. This means that the entire process of collecting data, conducting LCA studies and monitoring environmental impact is carried out in-house using a specific system that is certified by a third party in accordance with the most recent and updated international standards. In this way, the company is able to increase its awareness of the environmental impacts of its products, demonstrating a very high degree of focus on the issue of sustainability and maximum transparency towards stakeholders.

This type of approach has always been firmly rooted in all the company's industrial and organisational policies, both in the choice of raw materials and production sites as well as the choices of the whole supply chain. In fact, it takes years, huge investments in human and economic capital and know-how to achieve the results we can now boast of today, but above all it requires a deep-seated vision. In a company like ours, the most important manifestation of this vision must be based on a careful analysis of the production processes and, thanks to this division, Fassa has proved itself one of the leading players in the market. As a matter of fact, CO₂ emissions from fossil fuels are well below the industry average, thanks in part to the use of biomass to feed the kilns.

The EPD is therefore an important milestone: on the one hand, it distinguishes and qualifies Fassa Bortolo and, on the other, enables customers to choose a product – lime – not solely based on quality, but also based on objective data that measure its environmental impact.

↓ Download the EPD for dolomitic lime



↓ Download the EPD for calcitic lime



PRODUCTS



LIME

Lime is one of those usually invisible products that have a profound impact on our day-to-day life. It is used in many industries such as **the steel industry**, **construction**, **ecology**, **agriculture**, through to the **chemical industry** and **road works**, and in many environmental applications. Lime is renowned to be a highly versatile material and this is why it is suitable for numerous applications in different sectors.

Increasing public awareness of environmental issues has led companies operating in a variety of sectors to regard lime as a natural and highly environmentallycompatible product.

Lime is indeed the ideal environmentally-friendly additive used as a reagent in treating industrial and civil wastewater, stabilising and disinfecting sludge, and cleaning exhaust gas from waste-to-energy plants and thermoelectric power stations.



PRODUCTS

Here is our range of lime products, categorised according to their chemical-physical characteristics such as reactivity, mineral composition, grain size, etc. and based on the intended use of the product.

QUICKLIME

The firing method developed by Fassa Srl, together with use of biomass fuel, ensures the limestone is soft burned. This type of firing produces lime with high reactivity combined with low CO₂ content. The numerous controls carried out in the Fassa quarries guarantee a limestone with consistent chemical and physical characteristics, free of impurities and, consequently, high quality finished products.

GRAIN SIZE		SUPPLIED IN	
	SILO TRUCK	TIPPING TRUCK	BIG BAGS
0–3 mm	~	×	~
3–9 mm	\checkmark	~	\checkmark
8–20 mm	×	~	\checkmark
20-40 mm	×	~	\checkmark
>40 mm	×	\checkmark	\checkmark

OSSIDO HQ

Ossido HQ is a product composed of high-purity micronised quicklime. It is produced by grinding quicklime with grain size 3–9 and 8–20 mm, the noblest grain sizes. Grinding is carried out until the material is micronised. In this way,

Fassa is able to obtain micronised calcium oxide with high reactivity and purity. This product is especially appreciated in the chemical industry.

GRAIN SIZE		SUPPLIED IN	
GRAIN SIZE SILO TRUCK	SILO TRUCK	TIPPING TRUCK	BIG BAGS
0–1 mm	\checkmark	×	\checkmark

A line of low-carbon products with the following characteristics:

- High CaO content available
- Low CO₂ content
- High reactivity due to the soft burning of the limestone and resulting high specific surface area and porosity
- Low impurity content
- Ideal for low-carbon steel and stainless steel production.

		SUPPLIED IN	
GRAIN SIZE Silo Truck		TIPPING TRUCK	BIG BAGS
3–9 mm	\checkmark	×	~
8–20 mm	×	×	\checkmark

FASSASOIL

FASSASOIL is a line of products dedicated to soil stabilisation. Fassa lime is particularly appreciated in this sector because of its high reactivity, which speeds up the action of lime in the soil and enables the desired resistances to be achieved using a lower quantity of the product compared to traditional lime. Leveraging on its vast experience as a supplier in this sector, Fassa has optimised the grain size of FASSASOIL products to ensure the best user experience for the end customer.

CDAIN CIZE		SUPPLIED IN	
GRAIN SIZE Silo Truc	SILO TRUCK	TIPPING TRUCK	BIG BAGS
0–1 mm	\checkmark	×	\checkmark
0–3 mm	\checkmark	×	\checkmark

AGRICALCE CALCE VIVA

Agricalce is the line of products dedicated to agriculture. Available in different grain sizes and magnesium oxide content, these products are ideal for liming soil. Products in the Agricalce line offer the following characteristics:

- Correction and neutralisation of soil acidity
- Improvement of soil structure
- Cost savings on chemical fertilisers
- Higher productivity.

CDAIN CIZE	SUPPLIED IN			
UNAIN SIZE	SILO TRUCK	SILO TRUCK TIPPING TRUCK		
0–3 mm	×	×	~	
3–9 mm	×	×	\checkmark	

FLOW LIME

A line of finely-ground products that offer the following characteristics:

- Improving the performance of the lime itself: lime is injected directly into the slag and the small size of the individual grains ensures the product dissolves more quickly
- Increasing safety and improving the environmental conditions through reduced production of dust
- **Higher fluidity** through the use of fluidising agents and an optimised grain size curve for this purpose.

CDAIN CIZE	SUPPLIED IN			
GRAIN SIZE	SILO TRUCK	TIPPING TRUCK	BIG BAGS	
0–1 mm	\checkmark	×	×	
0–1 mm in mixtures of 15–20–25% MgO	\checkmark	×	×	

DOLOMITIC LIME

The high magnesium oxide content of Fassa's dolomitic lime makes it ideal for increasing its presence in the steel bath. It reduces wear of the refractory bricks, extending their operational life and reducing costs. Fassa's dolomitic lime is also particularly appreciated for its exceptional purity in the chemical industry.

GRAIN SIZE	SUPPLIED IN			
	SILO TRUCK	TIPPING TRUCK	BIG BAGS	
0–3 mm	\checkmark	×	~	
3–9 mm	\checkmark	~	~	
9–30 mm	×	~	\checkmark	
Briquettes	\checkmark	~	\checkmark	

AGRICALCE CALCE DOLOMITICA

Agricalce is the line of products dedicated to agriculture. Available in different grain sizes and magnesium oxide content, these products are ideal for liming soil and are the ideal treatment for agriculture.

In fact, like calcium, magnesium also plays a key role in maintaining soil structure and a crucial role in transporting carbohydrates in plants: only an adequate supply of magnesium enables the substances produced through photosynthesis to be transported to the growth organs. It should also be emphasised how easily magnesium is leached, i.e. removed by being carried to the deeper layers by water), especially in certain soils. After a soil analysis, it is recommended that magnesium be added to the soil.

Products in the Agricalce line offer the following characteristics:

- Correction and neutralisation of soil acidity
- Improvement of soil structure
- Cost savings on chemical fertilisers
- Higher productivity.

	SUPPLIED IN			
GRAIN SIZE	SILO TRUCK	TIPPING TRUCK	BIG BAGS	
0–3 mm	×	×	~	
3–9 mm	×	×	\checkmark	



FLOW LIME 40% (dolomitic), utilised in the steel industry, is used to extend the durability of the refractories, when the extremely fast action of quicklime is not required. Refractories are rich in Mg and the slag can be very aggressive for them. If the slag is already Mg-rich, the addition of lime makes it less aggressive for refractories.

CDAIN CI7E	SUPPLIED IN			
UKAIN SIZE	SILO TRUCK	TIPPING TRUCK	BIG BAGS	
0–1 mm	\checkmark	×	×	

OXIMUD

OXIMUD is the line of products composed of dolomitic lime with reduced grain size. They are particularly suitable in sludge treatment sector: the high percentage of magnesium oxide guarantees long-lasting reactivity. The grain size curve is designed to optimise the dispersion of the product in the matrix to be treated.

GRAIN SIZE	SUPPLIED IN			
	SILO TRUCK	TIPPING TRUCK	BIG BAGS	
Oximud F 0–1 mm	\checkmark	×	~	
Oximud G 0–3 mm	\checkmark	×	\checkmark	

HYDRATED LIME

Hydrated lime is produced from hydrating powdered quicklime. The high purity of Fassa's quicklime ensures rapid and complete hydration of the calcium oxide. The hydration reaction means that the grain size of the material is reduced and the surface area of the single granules is greatly increased. This characteristic makes the hydrated lime ideal for a wide range of applications: from exhaust gas treatment, water treatment, to use in construction. Fassa's hydrated lime product range is high performing in any application thanks to its purity and its chemicalphysical characteristics.

CDAIN CIZE	SUPPLIED IN			
UKAIN SIZE	SILO TRUCK	TIPPING TRUCK	BIG BAGS	BAGS
Micronised product	~	×	~	~



FASSASORB is a line of hydrated lime products, the alkaline substance that is most recommended for the de-acidification of exhaust gas produced by combustion processes (such as, for example, waste incineration, biomass combustion and other industrial processes).

The soft burning of the limestone and its subsequent hydration process give FASSASORB a high specific surface area and a pore volume that is suitable for neutralising exhaust gas and reducing acidic pollutants, such as hydrochloric acid and hydrofluoric acid, and acidifying substances such as sulphur oxide.

These characteristics enable a high degree of pollutant reduction thanks to the high reaction efficiency of the lime hydrated with hydrogen chloride.

GRAIN SIZE	SUPPLIED IN			
	SILO TRUCK	TIPPING TRUCK	BIG BAGS	BAGS
Micronised product	\checkmark	×	\checkmark	~

DOLOMITIC MIXTURES

The calcitic lime and dolomitic lime mixtures, produced exclusively in the Montichiari (Brescia) plant, have the advantage of combining the benefits of both products, optimising storage volumes and logistics. The final magnesium oxide content can be customised to the individual customer's requirements.

GRAIN SIZE	SUPPLIED IN		
	SILO TRUCK	TIPPING TRUCK	BIG BAGS
3–9 mm	\checkmark	~	~
8–20 mm	×	~	\checkmark
20-40 mm	×	~	\checkmark

35





APPLICATIONS

STEEL INDUSTRY

Not everyone knows that lime is an essential raw material in the **production of steel**. Thanks to its specific chemical properties, lime plays a decisive role by removing impurities such as silica, sulphur and phosphorus. Quicklime is used for smelting and refining steel; calcium carbonate and hydrated lime are used in the production of agglomerated iron ore to manufacture cast iron; finally, lime-based mixtures, with their excellent ability to remove sulphur, are used for the production of high quality steels.

Over the years, developments in the steel industry have prompted demand for increasingly highperformance raw materials. Thanks to its close ties with various Italian players in this sector, Fassa Bortolo has been able to develop a range of products that meet all their needs.

Over the last decades, the evolution and changes to production processes in the steel industry are reflected in the development of products as well as in the way lime is used.

The company's experience has resulted in the wide range of products designed for all stages of steel production: EAF furnace, ladle furnace (LF-AOD-VOD) and special applications.

Over the years, in response to specific requests from our customers, we have developed special products such as the low carbon (ELC) and high reactivity product line, properties that are difficult to find in the same product, and the line of finely ground products – Flow Lime – suitable for pneumatic transport thanks to their particular grain size curve and the use of fluidisers that prevent agglomeration. To increase the durability of refractories, we offer dolomitic lime with a high MgO content, or mixtures customised to the content required by the customer.

LIME

Fassa Bortolo lime products for the steel industry:

- Quicklime
- **—** Dolomitic lime
- **Dolomitic mixtures**
- **—** Flow Lime
- ELC

ECOLOGY

Lime is a quintessential natural material and its contribution to environmental protection is key: as a matter of fact, it is used for treating wastewater and sewage sludge, as well as for abating polluting exhaust gas from industrial plants, incinerators and thermoelectric power stations. A system that guarantees the highest effectiveness at a relatively low cost.

FLUE GAS Treatment

Hydrated lime is the main reagent in exhaust gas treatment processes in waste-to-energy plants, industrial plants and thermoelectric power stations. In this area, Fassa Bortolo has developed specific products for the individual needs of different plants, depending on the type of pollutants to be removed.

WATER TREATMENT

Water neutralisation, removal of impurities (such as sulphates, phosphates and fluorides) as well as the reduction of heavy metals can be achieved highly effectively in both civil and industrial plants with the specific use of hydrated lime and calcium oxide products.

SLUDGE/WASTE TREATMENT

Lime is also used in remediation or inertisation processes through the conditioning and sanitation of a wide range of waste materials. Thanks to these processes, industrial sludge, sewage sludge and dredging sludge can be recovered successfully.

LIME

Fassa Bortolo lime products for the ecology sector:

- Hydrated lime
- **—** Fassasorb
- Quicklime
- **—** Dolomitic lime
- Oximud G
- **Oximud F**

CHEMICAL INDUSTRY

Lime is one of the most important raw materials in the vast world of chemistry.

As a matter of fact, most producers of calcium salts use it as a raw material. Lime is also used to produce technical gases for industrial use, animal feed and for sophisticated industrial applications such as the production of high-performance lubricants, anti-friction products (stearates) and many others.

Since lime is extremely multi-purpose in nature, it has always been used widely in the chemical industry as a basifying agent. It can also be used as a carrier of Ca++ ions to create calcium based salts and compounds, which in turn are the raw materials for other products. In this case, it is essential to use a high-purity lime to avoid introducing impurities into products that will be used as raw materials in future processes.

Another common use of lime is to raise the pH level. The main advantage in this case is the speed of the reaction combined with the low price of the reagent. This pH variation can be used to precipitate metals or compounds.

Other important applications include basic hydrolysis, the production of calcium acetate and many others.

With appropriate modifications to the production processes, lime can be used as a substitute for limestone: thus the CO_2 emissions into the atmosphere as a result of process reactions can be reduced significantly. Moreover, the storage space for lime is half that of limestone, even though they introduce the same amount of calcium into the process. This may optimise both storage and logistics.

Quicklime is commonly used as a dehydrating additive on account of its efficient and speedy reactivity in contact with water. This makes it particularly suited to reducing H₂O content in one stage of the production process.

Building on its hundred years of experience in lime production and the use of innovative fuels, Fassa Bortolo can produce a broad range of products with these characteristics.

Some examples of applications in which our products are used are:

- Production of calcium carbide and other calcium-based compounds

LIME

- Production of glass and glass fibres
- Production of fertilisers
- Production of dehydrating additives for the plastics industry
- Additive for the tanning industry

- Reagent for the recovery and refining of precious metals

Fassa Bortolo lime products for the chemical industry:

- **—** Quicklime
- Hydrated lime
- Ossido HQ
- **—** Dolomitic lime

SOIL STABILISATION AND ROAD WORKS

The many properties of lime include soil consolidation and stabilisation, a technique that is widely used by numerous construction companies in Italy and abroad. Lime thus plays a decisive role in the construction of foundations for roads, railways, airport runways, landfills and artificial channels. Adding lime to clayey and silty soils improves their mechanical characteristics.

SOIL STABILISATION

Soil stabilisation using lime is a well-established practice involving the addition of calcium oxide, dosed on its own or in combination with cement, to clayey or silty soils to reduce plasticity and enable optimal compaction in a cost-effective way. Treatment using only the dosing of lime is usually carried out on some Group A2 soils and on Group A6 and A7 soils, while the dosing of lime/cement mixtures is carried out on some Group A2 soils and on Group A4, A5 and A6 soils.

Calcium oxide (quicklime) is added to the soil that is being stabilised in a given percentage and it has a twofold advantage: through the hydration process, it absorbs water chemically (up to 1/3 of the weight of the added lime) and, since the hydration reaction is highly exothermic, it will also dry out the soil.

The silica and alumina in clayey soils react with the calcium to form calcium and aluminium hydrates. These reactions are similar to those that occur in cement when it hardens and last for years.

The reactions occur through two distinct processes:

- 1. Rapid ion exchange improves the chemical and mechanical characteristics of the soil, thus changing it
- 2. Slow lime/soil pozzolanic reactions known as stabilisation/solidification

LIME

The soft burning of the limestone carried out by Fassa Bortolo produces lime that has high calcium oxide content, low bulk density and high reactivity, which are optimal characteristics for the soil stabilisation process.

Fassa Bortolo lime products for soil stabilisation:

— Fassasoil 102XS

- Fassasoil 123XS

ROAD WORKS

The agent widely used to limit stripping of asphalt, i.e. the loss of adhesion between the surface of the aggregate and the bitumen caused by the presence of moisture, is **hydrated lime**.

One of the effects of hydrated lime is it allows calcium ions to precipitate on the surface of the bituminous concrete, making it more suitable for bitumen. Calcium can accumulate on the surface of the aggregate and can bind with the acids in the bitumen, forming salts that are insoluble in water. Thus, hydrated lime reacts with the silica and alumina in the aggregates forming pozzolanic binders and strengthening the bonds in the mixture.

Experience over the years has shown that adding 1-3% of hydrated lime when preparing bitumen improves resistance to deformation and yields benefits for viscosity at high temperatures, especially early on, improving resistance against cracks and the accumulation of permanent deformations, thus extending its average life and preventing cracking at low temperatures.

FASSA's hydrated lime is fully compliant with the CL90-S characteristics of the EN 459 standard and ensures durable, high quality paving.

Fassa Bortolo lime products for road works:

AGRICULTURE AND ANIMAL HUSBANDRY

AGRICULTURE

Adding lime to soil for growing crops, commonly known by the technical term 'liming', is a practice that has been widely used in agriculture for millennia. As a matter of fact, lime corrects and neutralises the acidity in the soil, improves its physical structure, aids water absorption and root penetration thus increasing crop yields, regulates fermentation in composting and is an excellent disinfectant that has a low environmental impact.

While soil acidification is a natural process that is part of weathering, it can be increased by acid rain and overuse of fertilisers. Each crop requires a particular soil pH for optimal growth. While some crops prefer acidic soils, most need soil that is not too acidic, such as barley, wheat, potatoes, alfalfa, maize, rice, apples and walnuts.

One of the most commonly used minerals for liming and soil disinfection is quicklime (or hydrated lime). Calcium Carbonate Equivalence (CCE) measures the capacity of a calcifying material to neutralise acids compared to pure calcium carbonate (CCE of 100%). For a given weight, quicklime has a CCE of 179 and is therefore classified as a highly efficient liming material.

LIME

The main benefits of spreading lime in the soil are:

PHYSICAL Benefits

CAN BE USED AS A SOIL CONDITIONER

Lime gives soil a better structure that enables a greater flow of air and water.

CHEMICAL BENEFITS

CAN BE USED AS A SOIL CORRECTIVE

Spreading lime acts as source of calcium (and magnesium in the case of dolomitic lime) and raises soil pH: nutrient solubility is improved compared to soils with an acid pH. Increased pH leads to a reduction of aluminium and manganese in soluble form, increased availability of nutrients such as nitrogen, phosphorus, potassium and the insolubilisation of certain toxic substances such as heavy metals.

BIOLOGICAL Benefits

CAN BE USED AS A FERTILISER

The capacity of the soil to host a wide range of organisms such as bacteria, worms, etc. is improved. This affects the nitrogen transformation processes in the soil and the mineralisation of the organic matter present.

Fassa Bortolo lime products for agriculture:

- Agricalce calce viva
- Agricalce calce dolomitica
- Hydrated lime

ANIMAL HUSBANDRY

Hydrated lime, produced by hydrating high-purity quicklime, is recognised as the ideal product for disinfection and for slowing down the multiplication of pathogens effectively, which is why it is used in animal husbandry.

Using hydrated lime to disinfect stables is a well-established process that has been used since antiquity. The method involves spreading the powered product in transit areas, as well as in the preparation and maintenance of bedding and stalls.

The high alkalinity produced (pH 12) prevents the invasion of pathogens brought in by people, wild animals, machines, etc. and acts as a barrier against bacteria and viruses. Escherichia coli and salmonella are inactivated in 24 and 2 hours respectively.

The advantage compared to other chemicals is that the product can be spread on the soil without any significant effects on the microflora because it reacts with the CO_2 in the air, forming calcium carbonate.

Fassa Bortolo lime products for animal husbandry:

Hydrated lime

BUILDING

Building is undoubtedly the oldest field of application of lime in the ancient times: the Romans used lime mortar to build their empire. Today, more than ever, lime is a fundamental component of masonry mortars and premixed renders. This is an area in which Fassa Bortolo guarantees the highest quality, with a complete range of products for any building work, from new constructions to restorations and renovations: pure lime-based mortars, mortars for facing brick walls, bio-mortars for the restoration sector, etc.

Today, most formulations of Fassa products use lime in their compounds , besides creating an excellent lime putty and fine mortar, both for self-consumption and for the market.

The types of lime used in the building industry range from quicklime in pieces, suitable for the production of lime putty and hydrated lime, excellent for the production of premixed products, to oxide with a high calcium oxide content, particularly suitable for the production of cellular concrete.

With the experience it has developed, Fassa has become the leading producer of lime products for the building industry:

- **—** Quicklime
- Hydrated lime
- Ossido HQ

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