# The Processing and Major Uses of Limestone





## High Purity Limestone Products

- Ground Calcium Carbonates (GCC)
  - High Purity Granular Limestones
- Limestone & Dolomitic Aggregates
- Calcium Oxide and Hydroxides
- Precipitated Calcium Carbonate (PCC)

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# Ground Calcium Carbonate Coarse/medium ground

## Agriculture

Calcium Carbonate has long been recognised as a useful addition to soil for agriculture, stabilising the acidity of soil, improving crop yields and minimising the fertiliser use. Calcium carbonate is also used in mushroom growing in the top-dressing applied to the spawn-run compost on which the mushrooms form.

## **Animal & Pet Feeds**

GCC is incorporated into animal feedstuffs as a calcium supplement and antacid. High purity limestone, with a low level of acid insoluble compounds, is an essential component of feeds for poultry, pigs and cattle. Poultry require grit in the gizzard to assist with digestion and strengthen shells for proper egg production.

## **Asphalt Filler**

Asphalt is a mixture of bitumen with sand and aggregate fillers which is used in the construction and repair of roads, car parks, pavements and driveways. Fine

# Fine/ultrafine ground

#### **Adhesives & Sealants**

Limestone (GCC) is used as a filler and viscosity control additive in sealants, joint fillers, grouts and ceramic tile adhesives (CTA's). Sometimes GCC can constitute up to 80% of the formulation.

#### Food

GCC is used as an inexpensive dietary calcium supplement and antacid. Food grade Calcium carbonate (E170) is added to all brown and white flour products in the UK.

#### **Household Products**

Polishing and cleaning products often use limestone as

ground limestones (GCCs) are used as a part of the solid aggregate filler mix.

## **Carpet-backing**

Limestone is an important filler for strengthening the latex backing of rugs and carpets. Latex-based carpet backing is the coating on the reverse side of a woven carpet that holds the fibres in place and provides a degree of resiliency and stiffness.

#### Ceramics

In low-fire bodies, limestone is sometimes added in small amounts as a filler to reduce fired shrinkage. It is also included in porous earthenware body recipes to prevent moisture expansion (causes glazes to craze). Limestone is also used as a flux in ceramic glazes.

## Mining

Powdered limestone is used as a dust suppressant in coal mines and helps provide passive fire protection and prevent explosions underground.

## **Pre-Cast Concrete**

The use of ground calcium carbonate (GCC) can improve concrete density, surface finish, physical properties and gives a lighter coloured concrete suitable for architectural applications. It is increasingly being used in applications, such as precast concrete products (block paving, paving slabs, roof tiles), ready mixed concrete and self-compacting concrete (SCC).

## **Synthetic Floor Tiles**

Limestone powders are typically used in plasticised PVC and plastisols in applications floor coverings (vinyl flooring, carpet tiles).

## Water & Waste Treatment

Limestone is used in the treatment of waste and drinking water to remineralise excessively soft water (aggressive to pipes) and to adjust the pH of acidic waters in lakes, waterways and reservoirs.

a mild abrasive or inert binder. Finely ground limestone will not scratch glass, ceramics or steel surfaces.

#### Paper

Fine grades of GCC are used extensively in paper manufacturing. Consistent particle sizing and colour are essential. As an alkali material it reduces acidity of paper, improving the durability of printed material.

#### Paints

GCC is used as functional filler and pigment extender in a variety of coatings including decorative paints, industrial coatings, road-marking paints, protective coatings, textured finishes, plasters and wood finishes.

#### **Pharmaceuticals**

Calcium carbonate is used as inert filler in tablets and as base carrier for veterinary products.

## **Plastics**

GCC is widely used as a functional filler in plastic products, comprising up to 25% of the volume, adding density, improving rheology and reducing cost. GCC is often blended or "coated" with additives such as stearates to aid bonding within the plastic

## Rubber

GCC is useful as an extender and in controlling the flow properties of products which are to be moulded or extruded.



# Crushed Stone Aggregates

## Concrete

Concrete is a composite construction material, composed of cement, aggregate (generally a coarse aggregate made from crushed rocks such as limestone, or granite, plus a fine aggregate such as sand), water and chemical admixtures.

## Construction

Limestone aggregates are used in variety of ways in construction projects including drainage & pitching, pipe bedding and foundation footings.

# **Chemical Stone**

#### **Flue Gas Desulphurisation**

Limestone is used to neutralise and remove acids (sulphur dioxide) present in the flue gases of power generating facilities, and is used in flue gas desulphurisation (FGD) at coal fired power plants and municipal waste-to-energy plants.

### Landscaping

Decorative limestone aggregates, chippings and grits are used in landscaping projects such as cycling ways and footpaths, driveways and car parks as well as for ground cover in gardens and rockeries.

#### Roadstone

Limestone aggregates, chatter and MOT type roadstone have long been used as a fill or base for the construction of roads and roadbed foundations.

# **Roof Chippings**

Limestone chippings are widely used a decorative, protective coating for felt flat roofs. The chippings provide a 'loading' weight to prevent the felt being lifted off by the wind as well as protection from the sun which would otherwise soften and degrade the felt.

## **Glass Manufacture**

Most commercial glasses consist essentially of silica together with soda (Na2O) and lime (CaO), the lime being partly replaced by magnesia (MgO) depending on the application. Lime is introduced into the glass melt as limestone (CaCO3) and magnesia by adding dolomite [CaMg(CO3)2]

#### **Iron Smelting**

In iron and steel manufacture limestone is used to remove impurities (usually in the form of silica or sand) from the molten iron in the blast furnace to form a substance known as slag which is easily removed.

# Dimensional Stone Large/massive

## **Building and Walling Stone**

Limestone is still used as walling stone in house builds and municipal buildings. St Paul's Cathedral and the Houses of Parliament are built from limestone. Random screened limestone is still used for traditional dry stone walling.

## **Monumental Stone**

Limestone blocks and polished panels are a decorative and tasteful choice for architects and

builders. The highest grade is monumental stone. This is a very uniform limestone with few surface imperfections. These properties make it ideal for carving and limestone of this class can hold very fine detail when used in sculpture, headstones, plaques, or ornamental features.

## **Dimensional Cut Stone**

Limestone is easily cut and is used to create a variety of bespoke products used in construction

ranging from window cills, mullions and door sets to steps, flooring and fireplaces.

## **Paving Stones**

Limestone paving is a popular because of its very hard wearing properties, and its lightly textured surface making it perfect for applications where a flat surface is essential.



# Lime (Burnt lime, quicklime)

## **Aerated Concrete Blocks**

Quicklime is mixed with cement, sand, water and aluminium powder to give a slurry which rises and sets to form honeycomb structured blocks which have excellent thermal and sound insulation properties.

# **Biosolids**

A wide number of organic and inorganic sludges can be treated using quicklime to increase solids content. Biological sludge can be sanitised by the raise in both temperature and pH, obtained by the addition of lime. Biosolids treatment up to 'Advanced Treated' is achievable with this method.

## **Calcium Silicate Bricks**

Calcium Silicate Bricks are made by mixing quicklime or hydrated lime with silica sand. The bricks are pressed into shape and then heated in an autoclave, which promotes reactions between calcium and silicates in the sand and gives extra strength..

## Chemicals

One of the main applications of lime, dolomitic lime

and their derivatives is as a raw material in the manufacture of commonly used chemicals. The two main areas of usage of lime is the production of inorganic chemicals or oil additives.

## **Contaminated Land**

Contaminated land can be treated using lime, dolomitic lime and/or lime binder mixes to adjust pH and immobilise sulphates, phosphates and heavy metals.

## **Effluent Treatment**

Lime products are widely used to treat waste and effluent water in order adjust pH prior to further treatment or discharge, precipitate metals, precipitate sulphate and fluoride and reduce feriliser contamination (phosphates and nitrogen).

## **Iron and Steel Manufacture**

Lime products are widely used to treat waste In many countries, lime is used more for iron and steel making than for construction and building. Most of the lime used is for fluxing impurities in the basic oxygen steelmaking (BOS) process.



## Limewash

Limewash is a traditional form of paint, used for the internal decoration of buildings with solid walls but without damp-proof courses. The moisture content of such walls is frequently high and varies with the seasons, meaning any wall decoration has to be porous.

## **Motor Oil Additives**

Certain oil additives (including those used for motor vehicles) are produced by reacting hydrated limes with alkyl phenates or organic sulfonates. The resulting calcium soaps act as wear inhibitors, helping to reduce sludge build up and neutralise acidity from products of combustion.

## **Plastics**

Quicklime reacts with any water present to form hydrated lime. This can be useful when dealing with products that are heated during the manufacturing process, such as plastic. When making plastic, if any potential water is not removed then steam bubbles may occur in the finished product, which can affect its strength and appearance.

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