

# LIME


— an essential material



Kotegawa Sangyo Co.,Ltd.



# Contributing to the Future of People and Nature.



Kotegawa Sangyo is located in Tsukumi city, Oita Pref., where blessed with one of the largest limestone mine in Japan. With it's high quality limestone, we have been providing lime-based various products and solutions to wide range of industries for over 126 years. Based on the long-standing experience and technology focused on calcium, we further accelerate research and development activities for new field and create higher value-added products. Keep on defining the needs of customers and society and contributing to the future of people and nature. That's our mission.

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# Process and Products

## Quarrying & Crushing

Limestone quarried out from the mine is crushed in stages and sorted into different sizes by screening. Some fractions are ground more finely and provided as industrial-grade products in powder form.

### Products



Limestone



Limestone Powder

### Used for

- ▶ aggregates, asphalt filler
- ▶ neutralization of acidic soil
- ▶ supplying nutrition for plants
- ▶ animal feed additives
- ▶ flue-gas desulfurization
- and more

## Burning

The crushed limestone ( $\text{CaCO}_3$ ) is burnt in a vertical furnace at high temperature more than  $900^\circ\text{C}$ , and it breaks down into calcium oxide ( $\text{CaO}$ ), i.e. quicklime, by giving off carbon dioxide ( $\text{CO}_2$ ). \*Carbon dioxide is captured and effectively reused.

### Products \*providing wide range of sizes



Quicklime



(Granular form)

### Used for

- ▶ pulp and paper manufacturing
- ▶ improving soil stability
- ▶ impurity removal for steelmaking
- ▶ moisture absorbing desiccant
- and more in chemical industry fields

## Hydrating

By adding water, the calcium oxide reacts with moisture and generates heat. The calcium oxide is transformed to calcium hydroxide ( $\text{Ca}(\text{OH})_2$ ), i.e. hydrated lime, in the process. The end product is strongly alkaline.

### Products \*providing wide range of sizes



Hydrated lime



(Granular form)

### Used for

- ▶ flue-gas desulfurization
- ▶ water treatment
- ▶ soil improvement for agriculture
- ▶ sugar refining process
- ▶ quarantine and disinfection
- and more

## Value Adding

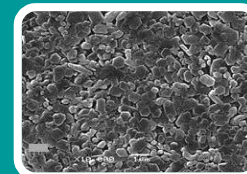
Hydrated lime reacts with carbon dioxide to convert it back to limestone ( $\text{CaCO}_3$ ) which is known as Precipitated Calcium Carbonate (PCC). Chemically controlling the particle of PCC is the key to create high-value product.

### Product

#### MONO - CARBONATE

< SYNTHETIC HEXAGONAL PLATE-FORM WHITE PIGMENT >

MONO-CARBONATE was created as a pigment for coated paper. The feature, offering higher glossiness and whiteness than that's of kaoline (clay) (the most major pigment), is derived from the carefully-designed particle shape controlling

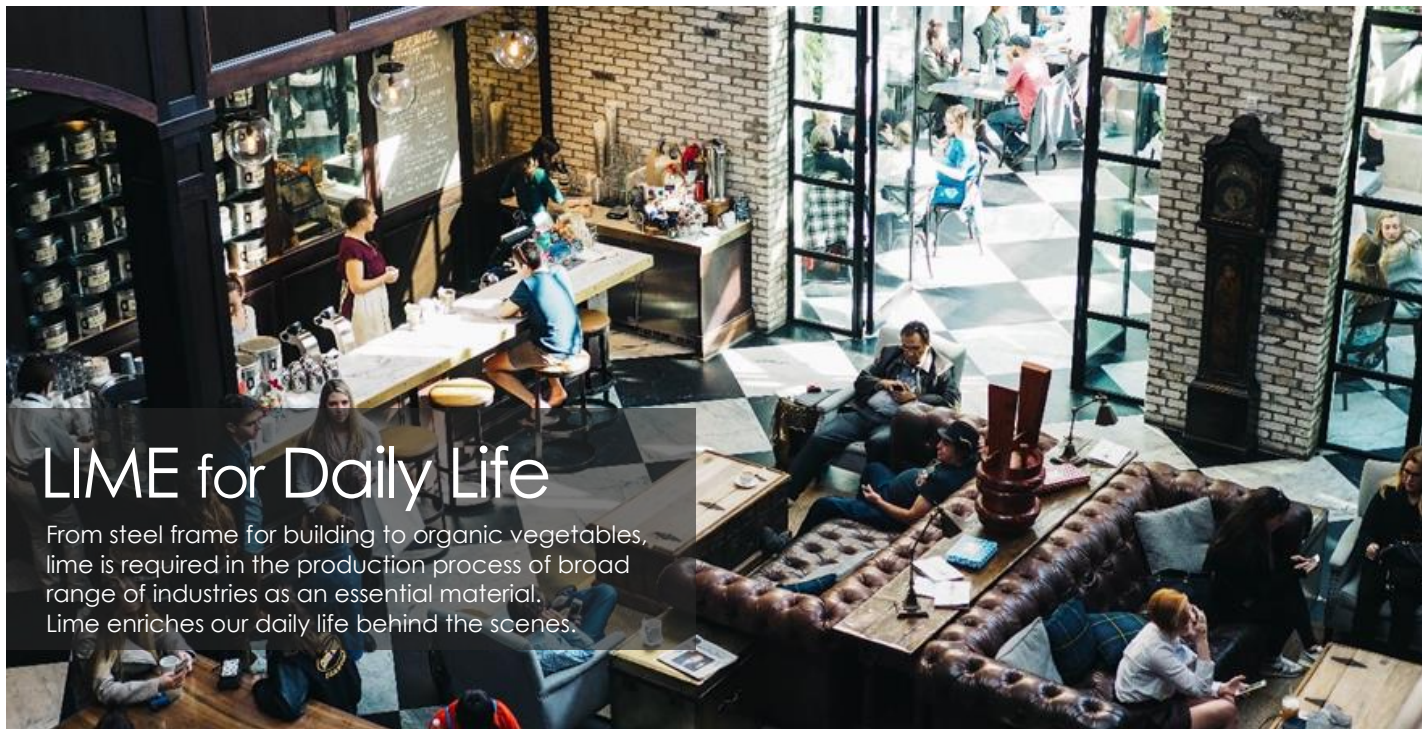


SEM photograph  
(particle size: aprx.  $0.9\mu\text{m}$ )



Most suitable for  
gravure printing





## LIME for Daily Life

From steel frame for building to organic vegetables, lime is required in the production process of broad range of industries as an essential material. Lime enriches our daily life behind the scenes.

## at the scenes

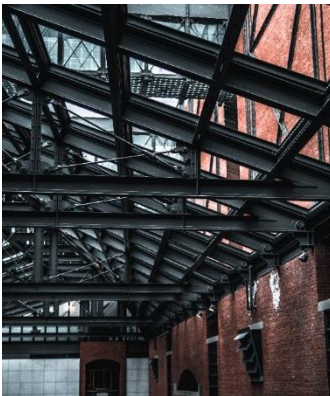
A moment in a café, for instance, many things are produced using lime-based products.

### Pulp & Paper



Quicklime is used in the process of caustic soda recovery to assist the chemical circulation of pulp manufacturing. Also, it increases strength and whiteness of paper as a filler material.

### Iron & Steel



Limestone is utilized to convert iron ore into pig iron in blast furnaces. Quicklime plays a role in removing impurities (silica, sulfur, phosphorus) from pig iron in basic furnaces and electric arc furnaces.

### Farm Products



In the agricultural sector, lime is widely diffused to supply farm products with mineral which is essential nutrients to grow well. In addition, lime is very effective for neutralizing the acidic soil.

### Sugar



In sugar production process, lime is used to absorb impurities. Hydrated lime is added to liquid sugar and reacts with  $\text{CO}_2$  to form calcium carbonate. It causes the precipitation of undesired colloids.

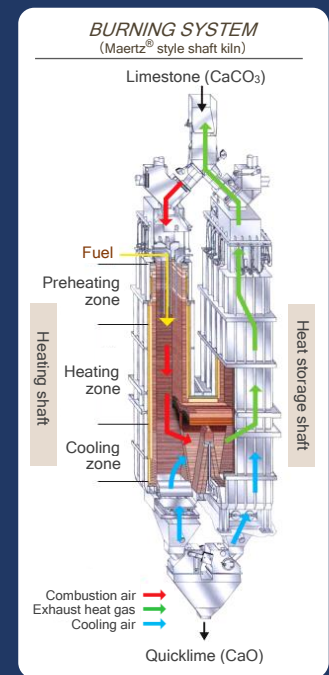
# TECHNOLOGY

pursuing quality and efficiency



## Quicklime Production Process

Limestone ( $\text{CaCO}_3$ ) is heated in a Maertz® style shaft kiln (furnace) at over  $900^\circ\text{C}$  to convert into calcium oxide ( $\text{CaO}$ ), i.e. quicklime, and the furnace consists of two shafts. While burning and decarboxylation of limestone is processed in the shaft, the other shaft is preheated by reutilizing the exhausted heat gas. The processes are switched at every constant time, and thus each shaft alternately repeats "heating" and "preheating" process to enable efficient quicklime production.



## Shift to Digital Basis



We vigorously push forward the digitalization of whole production process by introducing IoT and AI technology for managing the quality and productivity more exactly.





# LIME for Development

As an application for soil improvement providing stability and workability, lime is used at various construction sites of social infrastructure which makes our life and business more convenient.

## at the scenes

Lime-based soil stabilizing material contributes to the safety and efficiency of development projects.

Highway



The properties of ground where highway is constructed on vary widely. At the area of soft soil, lime-based product is used as an application of improvement to transform into stable ground that avoids the risk of road deformation caused by the load due to car traffic and road structure.

Building



When a large structure is constructed, such as shopping mall and office building, the ground must be assured of sufficient durability to bear the enormous weight. Lime-based product is widely recognized as an application of foundation ground improvement. For use in city-area, non-scattering type is also provided.

Harbor



Sediment accumulated on the sea floor is dredged up regularly in order to avoid running aground. The dredged soil, high moisture content and soft, is solidified by mixing with lime-based soil stabilizing material and is utilized as landfill soil in various situations including pier construction and industrial site development.

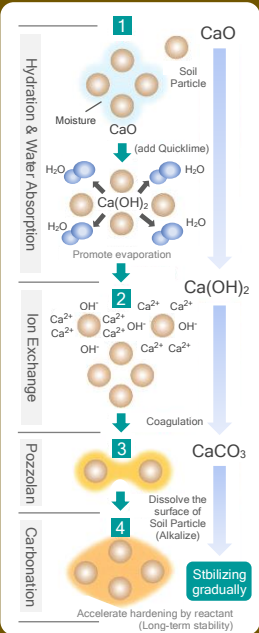
# IMPROVEMENT

ensuring stability and durability



## Reaction Mechanism

Adding quicklime to soft and high-moisture soil causes hydration reaction, and it induces dehydration and evaporation due to heating. Furthermore, because of hydration, the volume of soil is expanded. These bring the improvements of soil stability and workability. Then, due to ion-exchange reactions, the particles of soil are electrically coagulated, and the plasticity of cohesive soil is weakened as a result. Soil particles react with lime further to generate and harden the mineral crystals that provide enough stability and durability to soil. The effect of soil stabilizing by lime lasts for a long term.



## Products for Soil Improvement



| Series         | Product Name        | Soil Type   |
|----------------|---------------------|-------------|
| Regular        | Earthlime Q         | General     |
|                | Earthlime B-G       | Soft/Unique |
|                | Earthlime B-K       | Organic     |
|                | Earthlime H         | Gravel/Sand |
| Non-Scattering | Super Earthlime Q   | General     |
|                | Super Earthlime B   | Soft/Unique |
|                | Super Earthlime B-K | Organic     |



# LIME for Environment

As a safe and versatile alkaline resource, hydrated lime is an essential material for environmental protection measures. In addition, hydrated lime is used for quarantine to suppress the infections.

## at the scenes

Lime, the blessing of nature, is utilized for many approaches to keep the earth clean.

### Water Treatment



In the water supply process, hydrated lime mainly plays a role of pH adjuster. For the treatment of sewage, as a flocculant, it assists coagulation, precipitation and dehydration of sludge.

### Plant & Factory



At refuse disposal plant, hydrated lime is blown into the flue of incinerator to absorb the hazardous substances such as sulfur dioxide and hydrogen chloride contained in the emissions.

### Greening



Greening is one of the major approaches as a global warming countermeasure. But most plants can not grow on strongly acidic soils. Lime is a popular solution to neutralize the acidic soil.

### also for Quarantine



Domestic animal infectious diseases such as bird flu and foot-and-mouth disease have a serious impact on animal farmers. Hydrated lime is widely used for disinfection thanks to strongly alkaline.

## TRUST

engaging in safe & stable production



### Quarrying Operations

We have been undertaking the operation of limestone quarrying from TAIHEIYO CEMENT CORPORATION, a major cement company in the world, and the quantity we quarry out is about 4million tons a year.



Based on safety-first policy, we are engaging in the stable production with the combination of high-performance heavy machineries and IoT technology.



### Tsukumi Mining Area



As one of the leading limestone production areas in Japan, the total output reaches approximately 25million tons a year. The reserves are estimated over 4 billion tons.



# Research & Development

"Exploring the future with calcium technology" Is the core idea of our company. Based on the long-standing experience and technology focused on calcium, we positively undertake research and development activities of high value-added materials. By developing better products for existing markets, and creating new functional materials for new markets, we provide solutions to meet customer demands and social issues with calcium-based material.



## Development Flow



## Fluorescent X-ray Analyzer

Analyzing the property and quantity of multiple constituent elements, such as silica and magnesium which influences the quality of product, in a short time without demolition of sample.



Ever since its establishment, we, as a manufacturer of JIS (Japanese Industrial Standards) accredited products, have been working on thorough quality control to provide a stable supply of high quality and been proactive in introducing various advanced analyzing instruments. Also, we have achieved ISO 9001 certification to address the continual improvement for offering a satisfactory quality to our customers by constructing and operating the whole business process from manufacture to sale.



## Carbon / Sulfur Analyzer

Content percentage of carbon dioxide and sulfur in product is directly linked to the quality. The analyzer measures the wide range of concentration of carbon and sulfur in solid.

## ISO 9001 Certified



## Quality Control





# Corporate Profile



## Outline (As of January 31, 2022)

|                      |  |
|----------------------|--|
| Company Name         | Kotegawa Sangyo Co.,Ltd.                               |
| President and CEO    | Yasumasa Kotegawa                                      |
| Established          | March 1895   |
| Capital              | ¥79,500,000  |
| Head Office          | 1-4 Gonomotomachi, Tsukumishi,<br>Oita 879-2471, Japan |
| Employees            | 130  |
| Affiliated Companies | 10   |

## Scope of Business

1. Manufacture and sale of lime-based products.
2. Research and development of functional synthetic calcium carbonate.
3. Quarrying of limestone

## Production Capacities (per month)

|               |           |
|---------------|-----------|
| Quarrying     | 500,000 t |
| Quicklime     | 13,500 t  |
| Hydrated Lime | 8,000 t   |
| Limestone     | 3,000 t   |



