

ALKEGEN

Thermal Management Solutions

Continuous Annealing and Galvanizing Lines



Continuous Annealing and Galvanizing Lines

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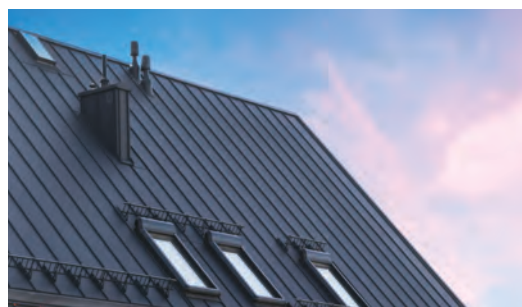
Continuous Annealing and Galvanizing Lines

Introduction

Alkegen's high temperature insulation and refractory solutions are used as energy saving solutions throughout the entire continuous annealing and galvanizing process in steel manufacturing plants.

Steel manufactures worldwide use continuous annealing lines to restore the mechanical properties of cold rolled steel, and continuous galvanizing lines to improve the corrosion resistance of steel. At a high level, a steel strip (or coil) is heated up to its annealing temperature and then dipped into a molten metallic bath to coat the surface of the steel, which provides corrosion resistance. This galvanization process is completed at a large industrial scale and requires innovative heat management solutions to ensure that there is a precise controlled rate of heating and cooling throughout the entire process. Galvanized steel sheets are used across a handful of industries and applications, including automotive, construction, household appliances, and furniture.

Alkegen's high temperature insulation and refractory solutions allow steel manufacturing plants to safely operate at extreme temperatures, reduce emissions, and save energy. The operating temperatures throughout a Continuous Galvanizing Line change as the steel coil is transported throughout the various sections of the process, temperatures spanning anywhere from 400-1350°C (752-2462°F). Alkegen offers superior thermal insulation solutions for each step in the process. A more detailed outline on the Alkegen heat management solutions used throughout the process is provided in the following pages, including typical designs and materials used in each section.



Continuous Annealing and Galvanizing Lines

Alkegen – Your Steel Industry Partner

At Alkegen, we deliver innovative heat management solutions that enable the iron and steel industry to operate safely, reduce energy, minimize emissions, and save money.

Alkegen is a worldwide leading producer of specialty insulation materials and has provided thermal management solutions for the iron and steel industry for over 75 years.

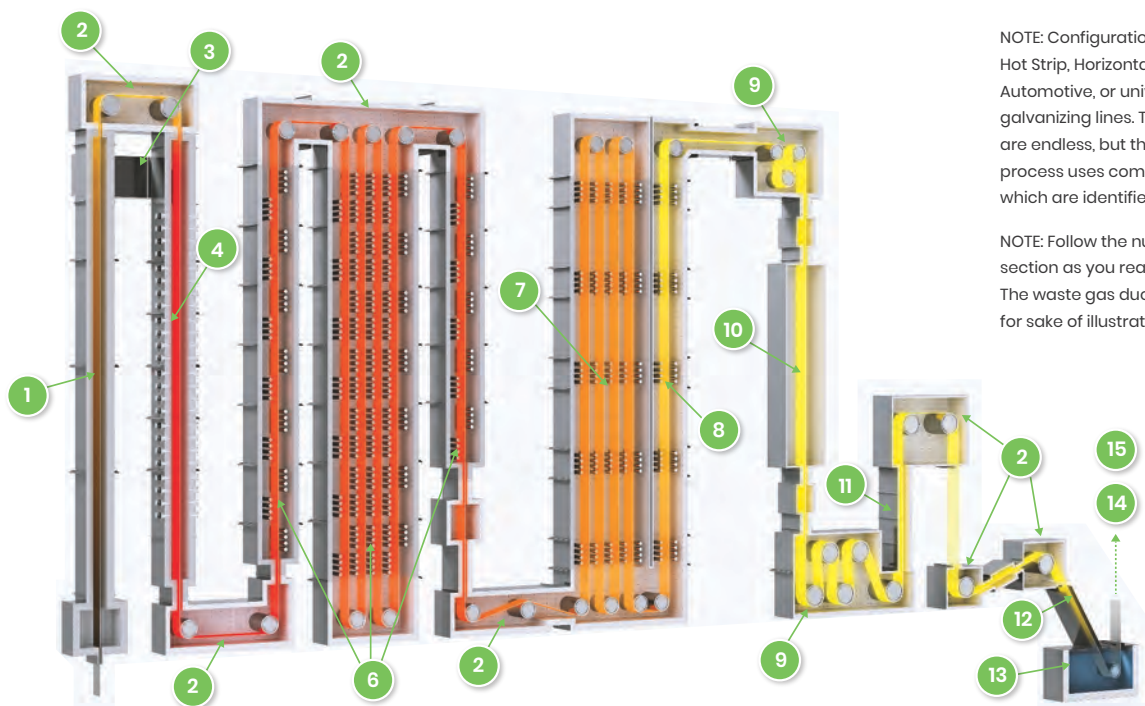
Alkegen is committed to solving extreme temperature problems and providing exceptional value to our customers. This commitment is evident in our broad product offering including bulk fiber, blankets, boards, modules, papers, felts, woven textiles, ropes, braids, coatings and mixes, refractories, and accessory products.

Alkegen's thermal management solutions are the tried-and-true leaders for the iron and steel industry. From start to finish, Alkegen materials are used throughout the entire steel manufacturing process. This brochure focuses solely on the Alkegen solutions that are commonly used in the Continuous Annealing and Galvanizing Process in Steel manufacturing plants.



General Assembly Illustration

(Ex. Vertical Continuous Galvanizing Line)



NOTE: Configurations can vary, whether it be for Hot Strip, Horizontal, Vertical, U-Shape, L-Shape, Automotive, or universal annealing and continuous galvanizing lines. The designs and configurations are endless, but the annealing and galvanizing process uses common equipment/sections, which are identified in this brochure.

NOTE: Follow the number identification for each section as you read through the brochure. The waste gas ducts (Section "5") not shown for sake of illustration clarity.

Continuous Annealing and Galvanizing Lines

1 Preheating Section

The preheating section of a continuous galvanizing line typically operates at temperatures from 800–1200°C (1472–2192°F). The preheating section is the starting point of the galvanizing line. The steel coil enters the preheat section and is heated up to $\approx 250^{\circ}\text{C}$ (482°F) as it travels through this section. The preheating section is indirectly heated by waste gases from the direct fired furnace (DFF), post-combustion chamber, and radiant tube heating sections.

Alkegen Insulation Solutions:

Modules

- Fiberfrax Anchor-Loc Modules
- Insulfrax Anchor-Loc Modules
- Isofrax 1400 Anchor-Loc Modules

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets
- Isofrax 1400 Blanket

Boards & Custom Shapes

- Thermfrax Vacuum Formed Shapes
- Fiberfrax Duraboards



2 Roll Chambers

After the steel strip travels through the preheating section, it enters a roll chamber (also referred to as turn rolls). Roll chambers are found at multiple steps throughout a vertical continuous galvanizing process to guide and turn the steel strip into various sections of the process. There will be less (or none) roll chambers required on a horizontal configuration. Roll chambers typically see temperatures from 400–800°C (752–1472°F) depending on what sections they are connecting throughout the galvanizing process.

Alkegen Insulation Solutions:

Modules

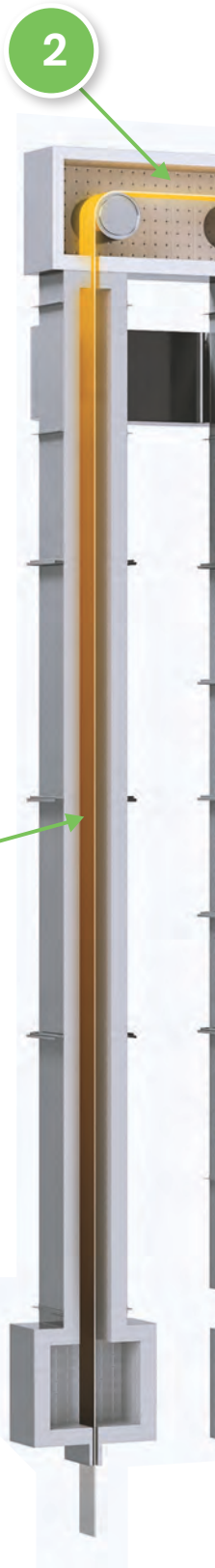
- Fiberfrax Anchor-Loc Modules
- Insulfrax Anchor-Loc Modules

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets

Boards & Custom Shapes

- Thermfrax Vacuum Formed Shapes



Continuous Annealing and Galvanizing Lines

3 Post Combustion Chamber

Located in the Bypass Flue between the direct fired furnace and preheating section, the post combustion chamber is a secondary combustion process that is used to recapture energy instead of losing it to the exhaust system. The post combustion chamber operates at extreme temperatures, typically around 1350°C (2462°F).

Alkegen Insulation Solutions:

Modules

- Saffil Anchor-Loc Modules
- Fiberfrax MX Anchor-Loc Modules

Blankets

- Saffil Blankets
- Fiberfrax MX Blankets

Boards & Custom Shapes

- Thermfrax Vacuum Formed Shapes



4 Direct Fired Furnace (DFF) Section

The Direct Fired Furnace (DFF) of a continuous galvanizing line typically operates at temperatures from 1100-1300°C (2012-2372°F). The DFF is also referred to as the Non-Oxidizing Furnace (NOF). This section is one of the hottest sections of the process as the steel strip is heated up to temperatures of roughly 650-750°C (1202-1382°F) by open flame burners located on the sidewalls.

Alkegen Insulation Solutions:

Modules

- Saffil Anchor-Loc Modules
- Fiberfrax MX Anchor-Loc Modules
- Isofrax 1400 Anchor-Loc Modules

Blankets

- Saffil Blankets
- Fiberfrax MX Blankets
- Isofrax 1400 Blanket

Boards

- Fiberfrax Duraboards

Coatings

- Silplate Mass
- Fiberfrax Coatings



Continuous Annealing and Galvanizing Lines

5 Waste Gas Ducts

Also referred to as the furnace exhaust system, the waste gas ducts typically operate at temperatures from 600-1100°C (1112-2012°F). There are waste gas ducts that receive exhaust from the direct fired furnace (DFF) and radiant tube heating sections. The waste gas ducts often include ductwork, a recuperator, and an economizer. The temperatures at the beginning of the waste gas ducts are the hottest, and they cool down as the waste gas travels to the exhaust stack.

Alkegen Insulation Solutions:

Modules

- Fiberfrax Anchor-Loc Modules
- Insulfrax Anchor-Loc Modules
- Isofrax 1400 Anchor-Loc Modules

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets
- Isofrax 1400 Blanket

Boards & Custom Shapes

- Thermfrax Vacuum Formed Shapes



5

– Not shown for sake of illustration clarity

6 Radiant Tube Heating Section

The radiant tube heating section typically operates at temperatures from 800-1000°C (1472-1832°F). This section contains radiant tubes and burners which are designed to bring the coil up to its required max temperature for annealing, up to 850°C (1562°F).

Alkegen Insulation Solutions:

Modules

- Fiberfrax Anchor-Loc Modules
- Insulfrax Anchor-Loc Modules
- Isofrax 1400 Anchor-Loc Modules

Blankets

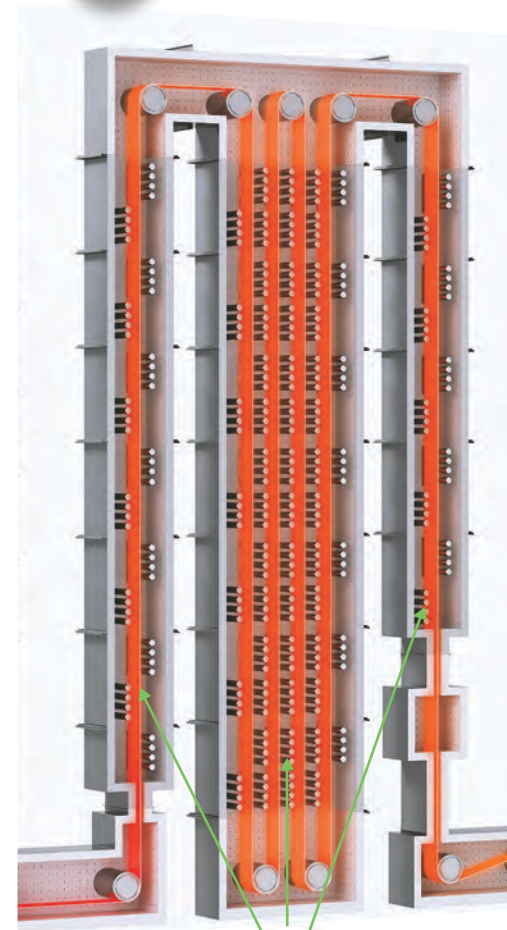
- Fiberfrax Durablankets
- Insulfrax Blankets
- Isofrax 1400 Blanket

Coatings

- Silplate Mass
- Fiberfrax Coatings

Boards & Custom Shapes

- Thermfrax Vacuum Formed Shapes
- Fiberfrax Duraboards



6

Continuous Annealing and Galvanizing Lines

7 Radiant Tube Soak Section

The radiant tube heating section typically operates at temperatures from 800-1000°C (1472-1832°F). After the coil has been heated to its maximum temperature in the RTH section, it travels into the radiant tube soak section to spend more time at temperature. The radiant tube soak section is designed with heaters and radiant tubes. The soak section can sometimes be substituted with an electric soaking furnace in specific equipment.

Alkegen Insulation Solutions:

Modules

- Fiberfrax Anchor-Loc Modules
- Insulfrax Anchor-Loc Modules
- Isofrax 1400 Anchor-Loc Modules

Boards & Custom Shapes

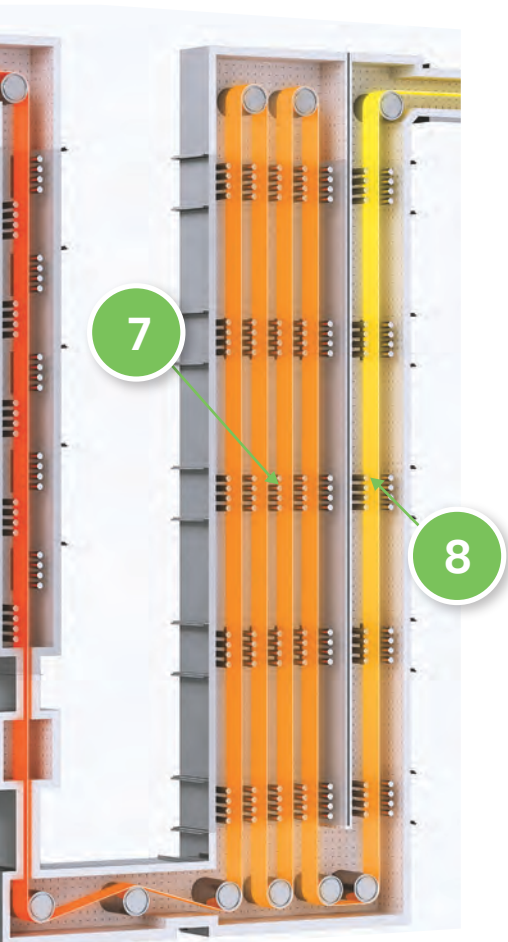
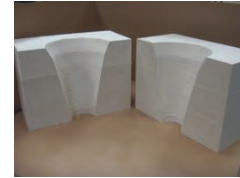
- Thermfrax Vacuum Formed Shapes
- Fiberfrax Duraboards

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets
- Isofrax 1400 Blanket

Coatings

- Silplate Mass
- Fiberfrax Coatings



8 Slow Cool Section

The slow cool section typically operates at temperatures from 600-800°C (1112-1472°F). The coil is discharged from the radiant tube soak section and travels into the slow cool section. The slow cool section controls the steel temperature necessary for entry into the rapid cooling section. Cooling tubes and electric heating elements are often used to control the cooling of the metal in this section.

Alkegen Insulation Solutions:

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets



Continuous Annealing and Galvanizing Lines

9 Bridle Sections (Hot & Cold)

Like the roll chambers, hot and cold bridle sections are used to control and ensure uniform coil temperatures that match the pot entry temperature. The bridles provide tension control to minimize shape distortion and ensure that the strip is flat and stable before coating. The bridle sections often use electric heating elements to create operating temperatures from 400–700°C (752–1292°F).

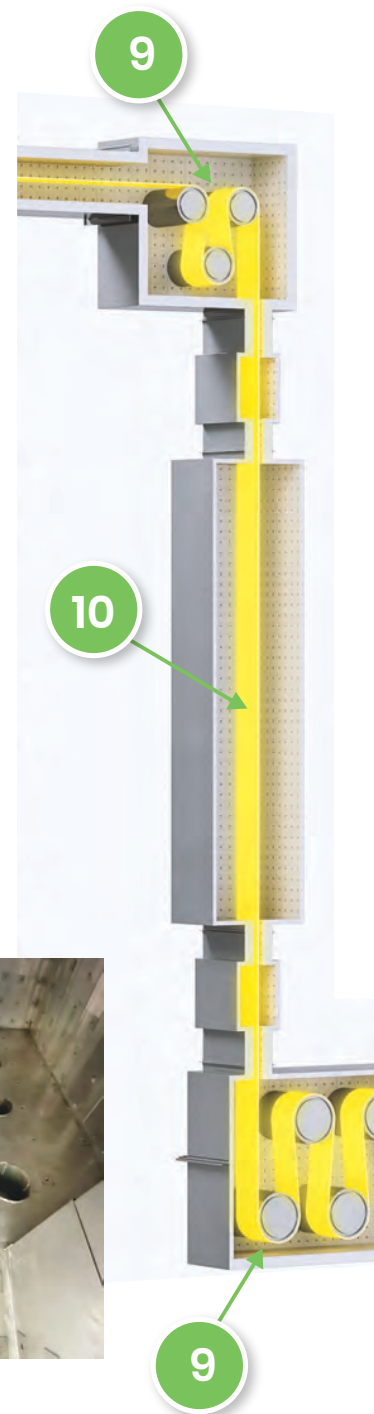
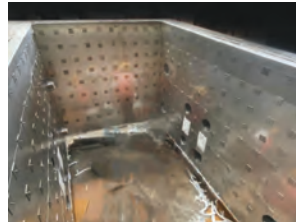
Alkegen Insulation Solutions:

Modules

- Fiberfrax Anchor-Loc Modules
- Insulfrax Anchor-Loc Modules

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets



10 Rapid Cooling Section

The rapid cooling section typically operates at temperatures from 400–700°C (752–1292°F). After the strip exits the slow cool section, it enters the rapid cooling section by a strong blast of cold gases to accomplish ultra-fast cooling. The strip will be rapidly cooled to the necessary metal temperature depending on the grade of metal, prior to entering the molten metallic bath pot.

Alkegen Insulation Solutions:

Blankets

- Fiberfrax Durablankets
- Insulfrax Blankets



Continuous Annealing and Galvanizing Lines

11 Exit Section

The coil discharges from the rapid cooling section and is directed to a series of roll chambers, and then off to the exit snout. The exit section typically operates at temperatures from 400–700°C (752–1292°F).

Alkegen Insulation Solutions:

Modules

- Fiberfrax Durablankets
- Insulfrax Blankets



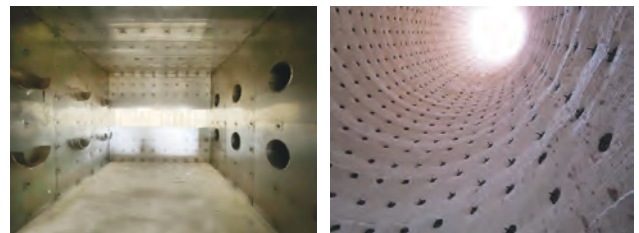
12 Exit Snout

The exit snout is the last step in the process as it guides the coil down from the exit section and into the molten metallic bath pot.

Alkegen Insulation Solutions:

Modules

- Fiberfrax Durablankets
- Insulfrax Blankets



13 Pot

The strip goes through a molten metallic coating, which coats the surface of the strip with a specific coating. There are a variety of zinc and aluminum-based coatings used.

14 After Pot Cooling Towers

The coating on the strip is solidified by rapid air blow cooling and quenched in water.

15 Surface Treatment

Final strip rolls are cleaned of solvents and/or contaminants, and rolled up, transported for storage.

The Alkegen Advantage



Operate Safely



Minimize Energy Consumption



Reduce Emissions



Direct Heat



Save Money

A Portfolio Of Trusted Product Brands & Forms

Fiberfrax

Durablanket

Saffil

Insulfrax

Isofrax

Thermfrax
Ultra 30G

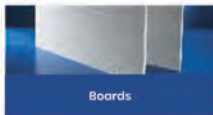
ThermSHAPe

Thermbond
REFRACTORY SOLUTIONS

Excellfrax



Blankets



Boards



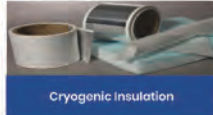
Coatings/Mastics



Fabricated Products



Fibers



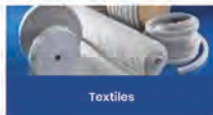
Cryogenic Insulation



Modules



Papers and Felts



Textiles



Microporous



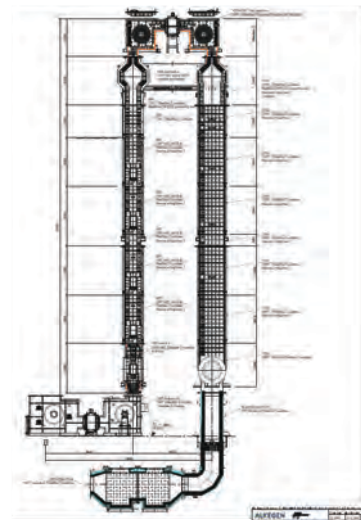
Microfine Glass Fibers



Vacuum Formed Components

Global Project Expertise and Engineering Support

- Dedicated technical expertise around the world.
- 24/7 technical support - product features, product advantages, installation instructions, and troubleshooting common problems seen in the field.
- Over 75+ years of specific industry and application experience.
- Detailed engineering design services with tried-and-true solutions (reference lists available).



Technical Proposals

(Heat Flow Program, Energy Savings, Emission Reductions)

Installation Drawings

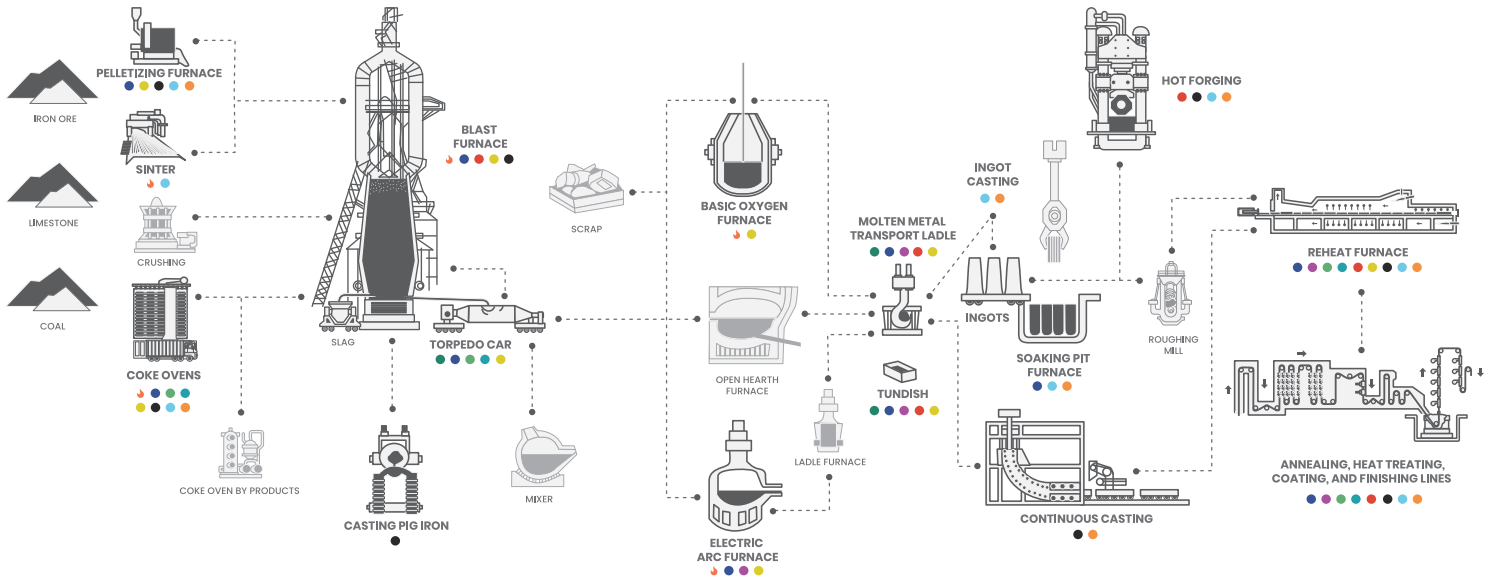
(AutoCAD 2D drafting, 3D Modeling)

Contact Alkegen Application Engineering For Assistance With:

Site Supervision & Installation Support

Refractory Estimation & Bill of Materials, Formal Quotations

Your Steel Industry Partner



CLEANER AIR

➤ For hot gas filtration, Purefrax® filters retain strength and integrity when exposed to heat. Their unique binding system provides superior industrial filtration, reducing particulate emissions by almost 100%.

For refractory repairs or full replacements Thermbond products help you optimize production, manage your risk, and get the most out of your refractory linings and shapes with minimal downtime.

MINIMAL DOWNTIME

ENERGY EFFICIENCY

➤ By minimizing heat loss, Alkegen's low thermal mass insulation reduces the energy required to maintain a desired temperature. This leads to lower energy consumption and contributes to furnace sustainability.

Our low thermal mass insulation products reduce energy costs. Minimizing heat loss requires less energy for heating as critical temperatures are maintained, resulting in significant cost savings over time.

COST SAVINGS

CARBON REDUCTION

➤ By implementing Alkegen's insulation products and solutions, you can reduce your carbon footprint through minimized energy consumption and improved furnace efficiency.

Heat loss happens. Alkegen's insulation solutions keep heat inside the furnace, maintaining consistent temperatures, and reducing temperature fluctuations for an efficient furnace environment.

REDUCED HEAT LOSS

Fiberfrax® Insulfrax® Isofrax® Saffil® Silplate® Excelfrax®

Product Brochures are periodically updated by Alkegen. Before relying on any data or other information in this Product Brochure, you should confirm that it is still current and has not been superseded. A Product Brochure that has been superseded may contain incorrect, obsolete and/or irrelevant data and other information.

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ALKEGEN

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