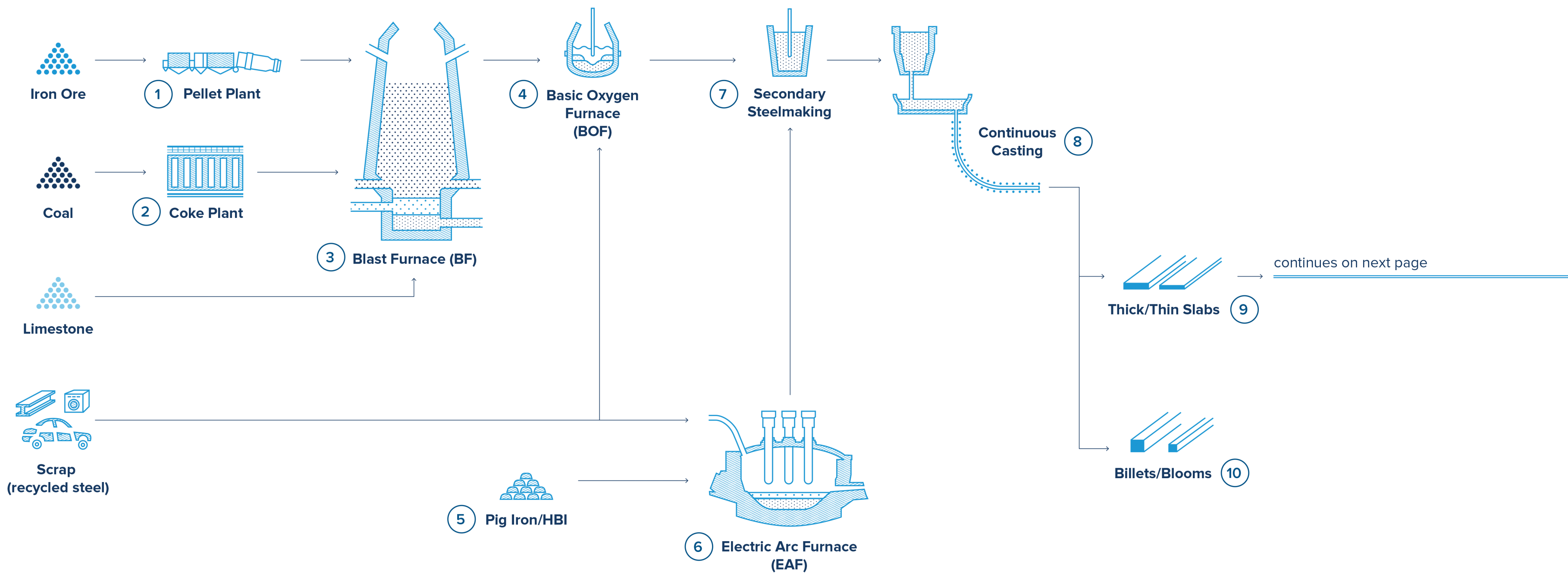


How We Make Steel

Integrated Mills and Mini Mills

U. S. Steel uses two different processes for making steel: integrated and mini mill. The integrated process relies on blast furnaces and basic oxygen furnaces, while the mini mill process uses electric arc furnaces (EAFs). Each process uses different materials and energy sources, generating varying levels of GHG emissions.

U. S. Steel works hard to minimize the impacts of our steelmaking processes. Our company is developing capabilities to produce steel with lower GHG emissions that meets all the performance standards of our existing steel grades. Read more about our sustainable steels in our Inspiring Innovation section starting on [page 21](#).



Definition of Terms

- 1 Pellet Plant:** A unit that processes mined raw iron ore into iron ore pellets suitable for use in a blast furnace or direct reduced iron plant. It includes crushing, grinding, flotation, and heating/firing to form the pellet.
- 2 Coke Plant:** A unit that converts mined coal into coke by baking the coal in a non-oxidizing atmosphere.
- 3 Blast Furnace:** A vertical shaft furnace used for smelting liquid iron from iron ore pellets through heating and chemical reduction. Coke is used as the main fuel and reductant, while limestone is added to absorb impurities.

- 4 Basic Oxygen Furnace:** A furnace that works by blowing pure oxygen into it to convert liquid iron and steel scrap into liquid steel.
- 5 Pig Iron/HBI:** Pig iron is produced by solidifying liquid iron from a blast furnace into individual small ingots, or “pigs.” Hot briquetted iron (HBI) is produced in a direct reduction process, where iron ore pellets are heated and chemically reduced without melting. Both of these products are classified as Ore-Based Metallics or Scrap Substitutes.

- 6 Electric Arc Furnace:** A furnace that uses mostly electricity, supplemented by oxygen injection, to melt steel scrap and ore-based metallics into liquid steel.
- 7 Secondary Steelmaking:** A group of processes that process and modify liquid steel from either the BOF or EAF to meet the final chemical and quality requirements through alloying, temperature adjustments and rinsing with argon.
- 8 Continuous Casting:** A process that takes the liquid steel and solidifies it, with the shape of the semi-finished product determined by the shape of the caster molds.

- 9 Thick/Thin Slabs:** Output of a continuous caster where the width is much larger than the thickness, and used for sheet and plate products.
- 10 Billets/Blooms:** Output of a continuous caster where the width and thickness of the product is similar. The cross-section can be square, rectangle, or round, and the blooms are used for seamless pipe and long products.

How We Make Steel

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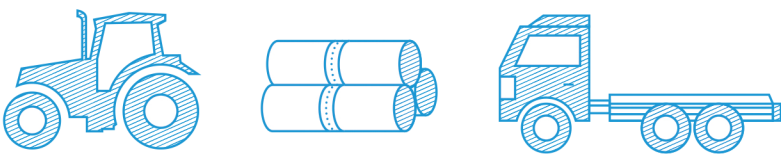
1 Hot Strip Mill



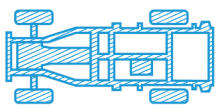
2 Pickle Line



3 Cold Mill



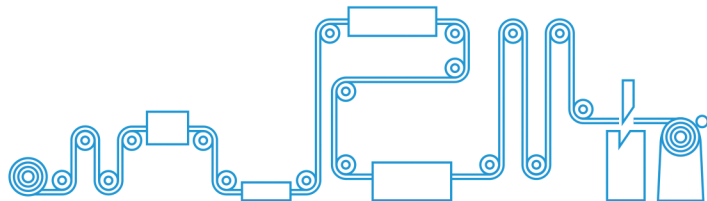
Hot Rolled Product



Hot Rolled Pickle & Oiled Product



Hot Dip Coated Product



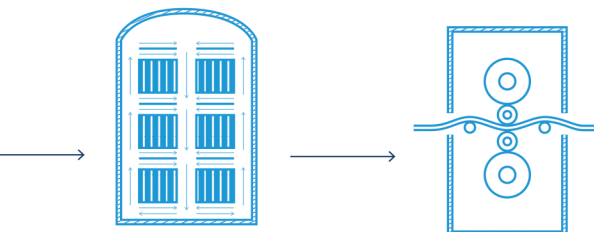
5 Paint Line



Pre-Painted Product



Cold Rolled Product

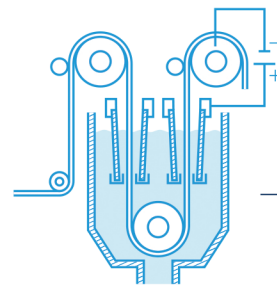


6 Batch/Box Annealing

7 Temper/Skin Pass Mill



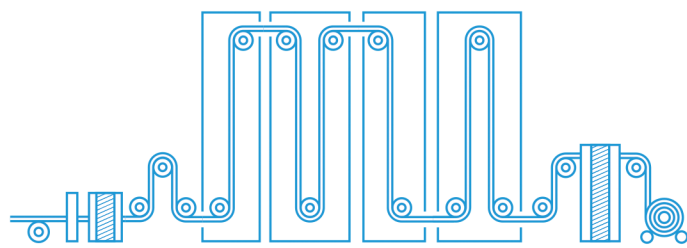
Tinplate Product



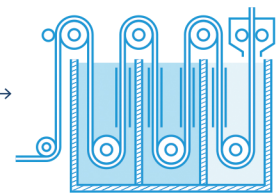
9 Electrotinning Line



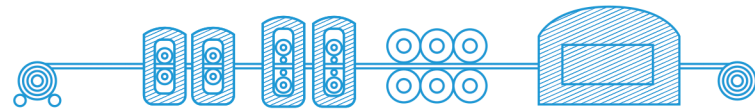
Tin Free Steel Product



8 Continuous Annealing Line



10 Tin Free Steel Line



11 Non-Grain-Oriented Line



Non-Grain-Oriented (NGO) Product

Definition of Terms

- 1 **Hot Strip Mill:** A unit that reduces the thickness of the slab and rolls the material into a hot rolled coil by heating the slab up then rolling. The hot strip mill can be a standalone unit (at our integrated plants) or connected to the slab caster (at our mini mills).
- 2 **Pickle Line:** A line that cleans the surface of the sheet after hot rolling.
- 3 **Cold Mill:** A unit that further reduces the thickness of the sheet, performed at ambient temperature. The cold mill is often coupled with the pickle line. The product off of the mill is called Cold Rolled Full Hard (CRFH).
- 4 **Hot Dip Galvanizing Line:** A line that applies a zinc-based coating (Galvanize, Galvanneal, GALVALUME®) to the surface of the steel to provide corrosion protection. Lines also include a continuous annealing section for heat treatment of the strip.
- 5 **Paint Line:** A line that applies paint to the surface of the galvanized strip.
- 6 **Batch/Box Annealing:** A process that takes the CRFH coil and heat treats it over a period of days to recover formability, where the product remains as a coil throughout the process.
- 7 **Temper/Skin Pass Mill:** A mill that provides stiffness and surface finish to steel after it is annealed. For uncoated annealed product, the final product is cold rolled.
- 8 **Continuous Annealing Line:** A line that takes the CRFH coil and heat treats it over a period of minutes by unwinding the coil. Because the heat treatment is done only on the thickness of the sheet, the steel can be heated and cooled rapidly.
- 9 **Electrotinning Line:** This line uses electricity to apply a thin coating of tin to an annealed and temper rolled strip to produce tinplate.
- 10 **Tin Free Steel Line:** This line uses electricity to apply a chromium/chrome oxide coating to an annealed and temper rolled strip to produce tin free steel.
- 11 **Non-Grain-Oriented Line:** This line takes CRFH and performs a specialized continuous annealing step to produce non-grain-oriented electrical steels.