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# The Iron Age

Alloy = A substance formed from the combination of two or more metals. Alloys can also be formed from combinations of metals and other elements. The properties exhibited by alloys are often quite different from the properties of their individual components.

### **Examples of Common Alloys**

- Steel = Iron + Carbon
- Sterling Silver = Silver + Copper

Brass = Copper + Zinc Bronze = Copper + Tin

COPPER

AGE

3.500 BC

5.000 BC

METAL AGES TIMELINE

BRONZE

AGE

1.500 BC

IRON

AGE

1 AC





# Mass Production of Steel brought costs down





Bessemer set out to find a way of making steel from brittle pig iron, which contains significant amounts of carbon. Bessemer reconfigured his furnace to force cold air straight through the molten iron, even though his foundry workers told him the idea was foolish and the air would cool the iron. But Bessemer was proved right: airflow causes silicon and carbon to oxidize in an exothermic reaction, which – counterintutively – raises the temperature of the process.

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# Article Summary and Conclusions

### Highlights from the Article

- With all eyes on green steel production, an electric arc furnace powered by renewable energy offers the optimal route for carbon reduction.
- The advantages of an EAF are numerous, and EAFs today boast capacities and steel-grade production capabilities that parallel the BOF.
- The first furnaces were adopted in North America, in both the U.S.A. and Canada.
- An electric arc furnace makes up nearly one-third of global steel production today.
- Scrap preheating method. A shaft captures the off-gas from furnace operations and redirects it to a section containing scrap prepared to be charged to the hot metal bath of the EAF.
- By preheating the scrap, energy savings are also a factor as the workload of the electrodes is spared the necessity of heating room temperature scrap.
- While this is only a brief overview, what's clear: the future is electric.

#### Additional Comments

- Cost to fully reline a blast furnace (20 years) is about 200 million.
- Cost to build an EAF is about 500 million but high reline costs are no longer needed.
- Blast Furnaces are not easily brought up and down but EAF's are easily started and stopped.
- BOFs are good at low residuals since they are not scrap based but EAFs have improved and continue to close the gap with BOFs.
- An EAF is essentially a recycling facility compared to a BOF which uses the mined products like Iron Ore and Coke (Coal).
- EAFs emissions are much better than BOF emissions, significantly more environmentally friendly.
- In most circumstances EAF costs are lower than BOF.

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