



## Electric Furnace Steelmaking

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### 1.5.1. INTRODUCTION TO ELECTRIC STEELMAKING

The history of electric steelmaking is quite short—only little over 100 years from the first trials to melt steel by utilizing electric power. During that period, great advancements have been attained both in furnace equipment and technology, melting practice, raw materials, and products. In this chapter, a short introduction to most significant progresses, features, and phenomena in electric steelmaking are presented.

#### 1.5.1.1. Short History of Electric Steelmaking Until Today

The electric arc furnace applied in steelmaking was invented in 1889 by Paul Héroult [1]. Emerging new technology started in the beginning of the twentieth century when wide-ranging generation of relatively cheap electric energy started at that time. First-generation furnaces had a capacity in between 1 and 15 t. The EAF had Bessemer/Thomas converters and Siemens Martin furnaces as strong competitors, initially. But its niche was the production of special steels requiring high temperature, ferroalloy melting, and long refining times.

In the 1960s, with the advent of billet casting, the EAF occupied another niche: it was the melting unit of choice for the so-called minimills, feeding billet casters for the production of rebar and wire rod.

In the following two decades, to better support the short tap-to-tap time required by the billet casters, the EAF reinvented itself as a melting-only unit. Steel refining was left for the recently introduced ladle furnace. Large transformers were introduced; ultra-high-power furnaces developed, which were made possible by adopting foaming slag practice. This way, tap-to-tap time became close to casting time.

By 1985, a new niche for electric steelmaking began to be taken: flat products, through thin slab casting and direct rolling. Also this process route has achieved a significant role in world steel production.

Altogether, the basic argument is that most of the ferrous scrap worldwide is recycled and refined to special steel just via electric furnaces. EAFs are versatile, charging everything from all sorts of scrap to hot briquetted iron (HBI), direct reduced iron (DRI), pig iron, hot metal. EAFs may produce all type of steel: long and flat, carbon and alloyed, for

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