# Productivity of Blast Furnace

# A blast furnace is a type of metallurgical furnace used for smelting to produce industrial metals, generally pig iron, but also others such as lead or copper. In a blast furnace, fuel (coke), ores, and flux (limestone) are continuously supplied through the top of the furnace, while a hot blast of air (sometimes with oxygen enrichment) is blown into the lower section of the furnace through a series of pipes called tuyeres, so that the chemical reactions take place throughout the furnace as the material falls downward. Due to the casting of cannon, the blast furnace came into widespread use in France in the mid 15th century. In 1709, at Coalbrookdale in Shropshire, England, Abraham Darby began to fuel a blast furnace with coke instead of charcoal. Coke's initial advantage was its lower cost, mainly because making coke required much less labor than cutting trees and making charcoal. The blast furnace remains an important part of modern iron production. Modern furnaces are highly efficient, including Cowper stoves to pre-heat the blast air and employ recovery systems to extract the heat from the hot gases exiting the furnace.

The four most important aspects of ironmaking profitability are Productivity, Hot metal quality, Furnace campaign life and Fuel rate.

Blast furnace productivity depends on the fuel efficiency and flow of materials and gases through different zones of the furnace. Productivity (THM/day) depends on the amount of carbon burned in unit time at the tuyeres and the tuyere carbon (coke) consumed for producing a unit of iron. However, the productivity from this definition depends very much on the size of the furnace, and cannot be used to measure the furnace performance, the specific productivity.

The drawback of these blast furnaces is that they are heavy on carbon emissions. For every ton of Steel produced, a blast furnace typically adds 2 tons of CO2 to the atmosphere. Various techniques like ULCOS (Ultra LOW CO2 Steel making) are being researched to reduce these carbon emissions.

**The Problem Statement**

A Steel manufacturer wants to find out the optimum values for the input parameters which both maximizes his blast furnace and also minimizes his carbon footprint. To this end, they have gathered data over a long period of days and tabulated them.

They have approached you to provide them with an:

* Appropriate model which can identify these parameters for their further investigation.
* Using the data you need to build a model which can predict **Productivity**