Optimization of the operation of an Iron and Steel Plant for Efficient Energy Utilization

Iron and steel are important industries worldwide. The total world production of crude steel was estimated at around 1,240 Millions tons in 2006 [1]. Steel is manufactured in the kingdom by SABIC Company through its HADEED (Saudi Iron & Steel Co.) affiliate. Since its formation in 1983, the annual production capacity of the company has increased, reaching more than 4 millions metric tons of finished products in 2005, consisting in flat, hot and cold rolled steel for local and regional engineering and manufacturing industries [2]. The iron and steel industry is characterized by three major aspects: First it is considered as one of the energy-intensive industries. The energy use for an integrated steel plant is in the range of 15-20 GJ/ton of liquid steel [3]. Energy costs represent therefore a considerable portion of the refining cost. The industry is also characterized by its emissions and their negative environmental impact. Gaseous emissions consist primarily of large volumes of carbon dioxide. These emissions are also an indication of the energy efficiency of the plant, since a reduction in energy consumption will reduce the environmental impact of these gaseous emissions. Finally, an iron and steel plant is characterized by the large quantities of solid wastes. [4]. With these three cited characteristics, it is no surprise that considerable research and industrial interest is directed towards the improvement of energy efficiency of the iron and steel industry. These improvements will help operate the plant in a way that maximizes the profit, minimizes the energy use and environmental impact.