Techno-economics of using sponge iron

S. R. BABU & M. SENGUPTA
Ispat Profiles India Limited, Sanaswadi, Dist Pune

Abstract

The DRI technology has emerged as one of the most successful technologies of the recent times and it is changing the process technology scenario of the steel industries. Owing to its inherent techno-economic advantages, it has been well accepted to substitute steel scrap by more than 50% in several steel plants abroad, using the EAF route. of late, several Indian manufacturers have ventured in putting up large commercial units and the production of DRI in India is steadily increasing. Ispat Group's Flaghip Company Nippon Denro Ispat Limited, Vashi has already commissioned the sponge iron plant with a prodcution capacity of 1.2 million tons. This together with the Ispat Group's overseas operations namely carbbean Ispat Limited, West Indies and Ispat Mexicana at Mexico have an annual production capacity of nearly 4 million tons which is the largest contribution by any group to the total sponge iron produced in the world. Surprisingly, however, the Indian steel makers have been skeptical about increased usage of sponge iron, especially in the case of stainless steel making through EAF route. In this lecture, an attempt is made to enable the Indian steel makers in the mini steel sectors, to overcome their apprehensions to use sponge iron in large quantities in EAF. The economic feasibility of using sponge iron has been analysed using a computer software developed for this purpose. The quantitative effect of the quality of sponge iron in terms of % gangue and % unreduced FeO, on the resulting slag volume, slag basicity, power consumption, electrode consumption, and hot metal yield has been predicted as a function of the quntity of sponge iron charged into the EAF and the concomitant cost effectiveness has been calculated. It is proved through these computed results that even at a price difference of one rupee, for a 30 ton capacity EAF producing about 50,000 tons/year, the savings achieved by using sponge iron merely to the extent of about 40% of the metallic charge itself could well exceed rupees one core per year.

The resuts of the plant data at Ispat Profiles India Limited over a period of 7 months, during which the DRI substituting the scrap was increased from a mere 17% to nearly 87%, have been presented. It is shown that the trends of increased power consumption, flux consumption, electrode consumption, slag volume and decreased % metallic yield, with the increased use of DRI have all been in accordance with the predictions made using the computer modelling.

The salient features of the practice at IPIL include automated continuous charging of DRI, hot healing and foamy slag practice, using the 60 ton UHP-EAF. Presently the

levels of S, P and Cu have been consistently contained to be 0.011, 0.009 and 0.012% respectively, which compares favourably even with published international figures. Such low values are well known to impart extraordinarily good properties of HBI to sponge iron manufactured by the Group's company - Nippon Denro Ispat Limited, Bombay, since the last 3 months. It has been shown that by operating at the present level of 87% sponge iron use in EAF, in comparison with the use of 17% HBI earlier, the cost of manufacturing has come down by morethan 10.0%. Currently, efforts are being made to further standardise the operating practice of melting sponge iron, so as to maximise the benefits.

Also, the results of a series of extensive plant trials in another mini steel plants are presented, to demonstrate that sponge iron can successfully substitute 50% of the steel scrap for the manufacture of stainless steel also, with a significant cost effectiveness. The special fearture of these plant trials consisted of using 'B' grade sponge iron fines through bucket charging in a 30 ton EAF, without affecting any modifications to the existing furnace.