

# Alternative charge materials - prospects & availability

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Electric arc steel making in India initially started with dual purpose of making essential steel castings and to produce pencil ingots for making merchant sections for building industry. The furnaces adopted double slag process. The productivity and the production were never critical at that time. Heat treated steel castings were very scarce in the country and the casting makers could ask for fabulous price for the product. Casting makers never felt any problem of charge because the yield of steel castings was never more than 55% and therefore 45% scrap was available to them from their own returns. The gap between selling cost and production cost being high they could manage the inputs at preferential prices. To quote an example in the present days steel castings are selling anywhere from Rs. 40 to Rs. 60 per kg. cast with ordinary methods. The same becomes Rs. 250/- to Rs. 450/- per kg. if they are precision cast. The bulk of castings manufacture even till date is around 0.25 million tonnes an year. Picture for the steel ingots required for forging is noway different. Forging ingots have stringent requirement of quality. Forging process requires quality ingots with gases like H, O, N below prescribed limits with inclusions at minimum. Forging requires a careful reheating cycle before the ingot is sent for forging. The ingots higher than 5T weight are essentially given vacuum treatment to bring down gases and inclusions within prescribed limits. In reheating prolonged antiflaking cycle is given. The final heat treatments are also cumbersome. All these make forgings scarce and difficult. The selling price being in the range of Rs. 60/- to Rs. 125/- per kg. the impact on charge materials can be absorbed.

The prospects of alternative charge materials arise when ingots and billets are cast for rolling purposes. The costliest rolled product is selling around Rs. 18/- kg. and to give an idea of magnitude of the bulk whereas steel castings produced in the country at the moment are around 0.25 million tonnes and forgings around 0.1 million tonnes the quantum of rolled product is around 12 million tonnes of this bulk share of arc furnaces is around 2.5 million tonnes. It is this later sector which needs the alternate charges because the integrated steel plants have their self contained way of producing. The problem is further aggravated with the fact that earlier through ingot route the inhouse generation of scrap was about 13% from the ingots returns (sprue, runners, ingots and choppings) and about 7% use to return from the rollers with the advent of continuous casters the yield of billet or slab making has gone to more than 97% and the generation of end crops is also reduced to not more than 2%. This has reduced the availability of return scrap. The market at large is also processing the billets from the concast route and therefore the availability of scrap in the market is also scarce. The only alternative is to look for the imported shredded scrap or else arrange for DRI, HBI or any other source.

DRI and HBI have given some lease of life to EAF because their production is affordable by medium size industries. In fact the present day planning of EAF is done essentially in conjunction with DRI or HBI. SUNFLAG Iron & Steel, NIPPON DENNRO, ESSAR etc., all are practical examples of it. These charges have got manoeuvrability of C, S, P, and are less power intensive than the hot metal of integrated steel plant produced in Blast Furnace. At present the bulk of DRI etc made available to EAF in our country is to the tune of 3.0 million tonnes. The melting technology adopted so far envisages use of about upto 60% of sponge iron in one form or other. The situation at present is slightly under control from the charge point of view because the rolling or SMS sides of many of the sponge makers have not yet been fully commissioned and therefore they are selling these sponges in the open market at the reasonable cost (Rs. 7000/- per ton) but the moment they are equipped with their mills again there will be problems. The realisation on the part of EAF has gone so deep that the prospecting for alternate charge is being taken as integral part of the EAF planning. The mining industry has also to modify its ways to cater to the changed needs.

The processes adopted for making the DRI have so far been kiln based using solid fuels. ESSAR GUJRAT have adopted Midrex process in their HAZIRA works using natural gas as fuel. Gas based DRI has added advantage of the adjustability of C and it is very low in S, P which makes it ideally suited for the flat products. Jindals are going to adopt COREX process in their works at Vijaynagar. Advantage with COREX is that it gives liquid metal as the final product which can be used directly in EAF on the lines of OH steel making.

From the experience of Brazil and China the notion of liquid metal from mini blast furnaces has also gained some ground in our country. The technology will have to stand the best of ecology before it gains ground. The basic idea in using all these process is to bypass cokeovens which is a cumbersome, capital intensive, environment unfriendly, and scarce raw material (coking coal) entity in the process of steel making. The other ideology is that rolled products do not have comfortable margine in selling and producing costs which is the case with castings and forgings. Therefore, if someone is nearly supplying billets or slabs for downward processing to rollers they are most pressed from cost and profit point of view. For them to look for alternate charge with economic inputs will have to be a continuous order of the day.

## Conclusions

The cost structure gives enough lease of life to castings and forging steel manufacturers whereas those manufacturing billets blooms and slabs for further rolling are most hard pressed from the point of view of the availability of the charge materials and marginal profits from the selling of the products. It is for these organisations that the alternate charges bear promise and it requires incessant effort on the part of research institutions to advice suitable alternate charge to match the economy.