SCRAP MELTING BY THE FUEL-OXYGEN-SCRAP PROCESS

A brief description of BISRA's recently announced FOS (Fuel-Oxygen-Scrap) process for melting scrap and making steel from a cold charge.

by John Pearson

While the application of oxygen-fuel burners has made possible the use of increased quantities of scrap, it also provides the opportunity to develop a new process operating entirely on cold charges. Such a process could be employed along with basic oxygen furnaces to consume the scrap that cannot be used as coolant in the converters, and, in addition, be regarded as a steelmaking process in its own right in a nonintegrated works.

The British Iron and Steel Research Assn. (BISRA) has been testing such a technique, which it has designated the *Fuel-Oxygen-Scrap* (FOS) process, and after many heats at its Sheffield Laboratories and at a local steelworks, the basis for such a technique has been determined.

The vessel used so far is of essentially the same shape as an electric arc furnace, although a somewhat greater height-to-diameter ratio is preferable. It is provided with the conventional forward and backward tilting gear to facilitate slag removal, when necessary, and tapping. The roof is removable to permit rapid basket charging and has a central opening for insertion of the oil-oxygen burner. Another opening near the periphery, is used for exhausting waste gas. The Toroidal Burner, developed by Shell International Petroleum Co. Ltd., has proved to be a suitable heating device.

The charge may consist of scrap and pig iron or entirely of scrap (with suitable carburizing agent). All forms of scrap, from heavy to light, have proved to be useable. The charge is rapidly melted by the flame, and under the conditions chosen, sulfur pick-up from the fuel is minimal.

Refining is carried out without shutting off the oil supply. By varying the oxygen and oil feed rates, it is possible to adjust both the rate of temperature rise and the carbon drop so that correct tapping temperature and carbon content is easily achieved. Carbon and low-alloy steels to current specifications have been made with yields in excess of 90%.

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The amounts of fuel and oxygen used, as judged by individual heats on a 5-ton scale, are approximately 20 gal and 6000 cu ft, respectively, per long ton of finished steel. It is expected that under continuous operation, these values would be much reduced. With adequate firing rates, a heat can be produced in 1 hr from charge to tap. Under these circumstances, the process is cheaper to operate than an electric arc furnace.

One particularly important feature is that at no time during the operation is there production of red fume; tests taken during complete heats have shown dust concentrations in the waste gas on the order of 0.01-0.02 grains per cu ft.

Although still in its infancy, the advantages of the FOS process generally appear to be:

1) Low capital cost;
2) Low operating cost;
3) Flexibility in charge composition;
4) Good output rates (in excess of those from electric arc furnaces of the same size);
5) Applicability to units of widely varying size;
6) Excellent control throughout, and particularly of tapping composition and temperature; and
7) Absence of red fume, and low dust emission (therefore no gas cleaning facilities are needed).

Investment in the EUROPEAN STEEL COMMUNITY

Extracted from the 1963 report, Investment in the Community Coalmining and Iron and Steel Industries, prepared by the High Authority of ECSC.

The 1963 survey of investment in the European Coal and Steel Community (ECSC) indicates that capital expenditure in the iron-ore industry, which until recently had been running at a fairly high level, has declined considerably. Only the producers in Lorraine, and to a lesser extent those in western France, are still thinking in terms of expanding their production potential in the years ahead; and even their estimates are lower than last year's. The proportion of imported high-grade ores in the iron and steel industry's total flow of supplies will continue to rise.

Iron and steel

The turnaround is less marked in the iron and steel industry, where, mainly owing to the continuance of operations begun earlier, investment reached record levels in 1961 and 1962, and will remain high in 1963 because enterprises will, in most cases, be unable to defer more than a fraction of the expenditure they were rating as indispensable at the beginning of the year. Production thus remains burdened by very high capital costs, hard to defray at a time when selling prices are falling all around: in 1962 capital expenditure per metric ton of crude steel produced, for example, amounted to something like $17.00 as compared with $9.00 in 1959 and similar figures in the preceding years. Not surprisingly, therefore, a number of enterprises have recently decided to postpone or to scrap various new projects, which will be missed later in 1964 and still more in 1965. The result will be to retard the industry's growth in the next few years, especially in the sectors where techniques are changing the fastest.

Pig-iron

Projects completed and approved as of Jan. 1, 1962, indicate a maximum production of about 74 million metric tons of sintered ore and 75 million tons of pig-iron for 1965. This year's estimates, however, are only 71 million and 73 million, respectively. The deceleration is thus greater for sinter than for pig-iron, despite the big advantage of further stepping up the proportion of sinter in the blast furnace burden.

Crude steel

For crude steel, the present estimates indicate, (assuming 96%

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