Technology boosts scrap use in BOFs

A new technology developed in Russia could allow BOF producers to significantly extend their scrap usage far beyond present limits while cutting production costs.

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The Russians have developed a family of proprietary technologies that make it possible to melt more scrap in the basic oxygen furnace (BOF).

Known as Z-BOP and implemented on an industrial scale, these technologies operate with solid ratios in the charge varying from 30 percent to 100 percent. All the Z-BOP technologies are routinely used at the West Siberian Steel Works (Zapsib), Novokuznetsk, Russia.

Bethlehem Steel Corp., USX Corp. and Inland Steel Industries Inc. are among those interested. Process sponsors report that Bethlehem employed Z-BOP to complete 52 trial heats of 100 percent scrap at its BOF shop in Bethlehem, Pa. Successful implementation and routine use of Z-BOP with up to 50 percent scrap was also reported in the Bethlehem shop.

These percentages greatly exceed customary usage in the U.S. When open hearths were replaced with BOFs, the major producers lost all flexibility in scrap use. The BOF can't melt more than about 30 percent scrap. This limitation left abundant scrap supplies for minimills and contributed to the growth of these smaller companies.

The new scrap melting system was developed at the Zapsib plant in Novokuznetsk. The plant has five BOFs—three 160 tons and two 350 tons. Capacity is 9 million tons a year and recent production has been at an annual rate of 5 million tons.

The Russian technology isn't limited to small scrap additions. "We can melt up to 100 percent solids in the BOF," says Dr. Gregory Gitman of American Combustion Inc., Atlanta. "There are several modifications of the technology," says Gitman, whose company is marketing the Russian practice in the U.S. in conjunction with Zaptech, the implementation arm of Zapsib.

Customized technology

"Each modification is optimized for specific shares of scrap and for specific economic conditions of the shop," says Gitman. "It also takes into consideration the limitations of sulfur and nitrogen for the steel grades required."

The fuel for added scrap melting is lump coal fed through the conventional top blown BOF bin system. "It requires practically no capital expense yet offers substantial cost reductions," says Gitman.

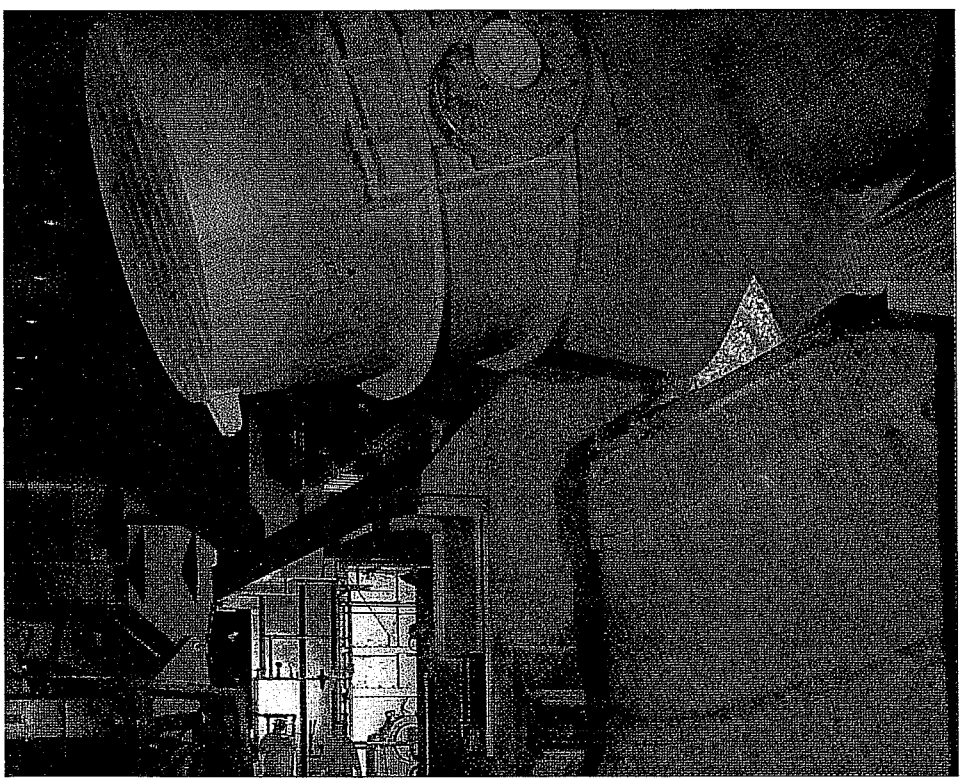
"Another major advantage of the Z-BOP process is its ability to produce BOF steel during blast furnace outages for relines or repairs," he says. "Minor interruptions of hot metal flow can quickly be compensated by increased scrap usage.

"These and other steel related Zapsib technologies are being considered by U.S. steelmakers. We have applied for multiple patents in the U.S."

It is something of a paradox that the large integrated mills are looking for ways to melt more scrap at a time the minimills are seeking to decrease their dependence on scrap. The minimills are going to reduced iron ore because the high yields of continuous casting have reduced the supply of prime scrap while new quality standards have boosted the minimills' requirement for the best scrap.

To fill the scrap gap, the minimills charged about 1 million tons of reduced iron in 1992. Nucor Corp. is now building its own direct reduction plant in Trinidad. Others are looking at captive iron production.

"For integrated mills," says Gitman, "the Z-BOP can be a favorable alternative because it reduces steelmaking costs when scrap prices are favorable, reduces dependence on dwindling coke and hot metal, and better accommodates blast furnace rebuilds and other interruptions in hot metal supply." ■



Bethlehem Steel has experimented with a new technology developed in Russia to melt greater amounts of scrap in its BOFs.