Atlantic Steel Using Cold Metal Charge Finds Costs in Favor of Electric Furnace

by J. E. Wilbanks

MELTING facilities at Atlantic Steel Co. consist of an open hearth shop of three furnaces tapping 80-ton heats, and an electric melt shop with one 18-ft JT Lectromelt furnace tapping 75 ton heats.

The electric melt shop was completed and went into operation in May 1952. Since then approximately 1200 heats and 75,000 net tons have been made. There were many problems in getting the electric shop started with open hearth furnacemen who had never seen anything more than a picture of an electric furnace.

The open hearth furnaces operate on an all cold metal charge of approximately 75 pct scrap and 25 pct pig iron. Coke is charged to make up for iron deficiency. The scrap charge is approximately 50 pct purchased scrap.

The type of purchased scrap has not changed since the electric shop went into operation. The bulk of purchased scrap is very light No. 2 country mix and No. 2 bundles. The electric and the open hearth are charged from the same cut of scrap and no preference is given to either shop. The charging of bundles has been discontinued in the electric because of excessive fumes. The fumes, high in zinc oxide, condense and collect on the electrode cooler rings and holders, causing trouble. As for the mill scrap, the electric has not gotten its pro-rata share. Because of light scrap, it is necessary to back charge three to four buckets to get a 75-ton heat from the electric.

During the past six months, the total charge for the two shops compares as shown in Table I. The burned lime charge in the electric was 45 pct less than in the open hearth. Standard practice of charging coke in the open hearth is reversed in the electric by charging roll scale. Enough experience has been gained to know that the performance in tons per hour is one thing with this type scrap, and that it would be much different with heavy mill or electric furnace scrap charge.

Further comparison for the six months period disclosed net metal in the electric was \$5 per ton under the open hearth. The electric showed 60¢ per ton lower labor cost. Mold and stool cost was practically the same. This was attributed mostly to tapping by an immersion pyrometer. Otherwise the tendency is to tap hotter heats out of the electric than the open hearth.

Considering fuel, the open hearth showed a \$3.85 per ton lower cost. A combination of fuel oil and natural gas is used in the open hearth. Kwh per ton in the electric was 507. Electrode consumption was 9.2 lb per ton, and power rate is 9 mills per kwh.

The open hearth had a \$4 per ton lower conversion cost than the electric. The electric showed 94 pct

Table I. Comparison of Charging Practice of Open Hearth and Electric Furnace

Charge	Open Hearth	Electric
Purchased Scrap, Pct	47	75
Mill Scrap, Pct	22	17
Reclaimed Scrap, Pct	6	8
Pig Iron, Pct	25	—

yield against 89 pct for the open hearth. Total ingot cost for the last six months period was in favor of the electric by 25¢ per ton.

In looking back over the short time that the electric melt has been in operation, it was encouraging to find that in the last month the cost of ingots was reduced by \$18 per ton under the first month. This can only be attributed to experience. It should be noted that both shops have been operating on the same heat schedules and no favoritism has been shown the electric in this respect.

In discussing the economics of an electric vs the open hearth, it is necessary to take a look at repair costs and furnace availability. The electric furnace is now on its sixth lining and sixteenth roof. The furnace is lined with metal encased basic brick and the roof is silica. Average life is 200 heats per furnace lining and 75 heats per roof. No hot patching is done other than routine use of a BRI gun between heats. The roofing is now being redesigned to a water cooled skew back. This, it is hoped, will considerably increase roof life.

A comparison of furnace availability between the open hearth shop and the electric furnace shop during the last seven months showed that the electric furnace operated 94.5 pct of all available hours, while the three open hearth furnaces operated 86.5 pct of total available hours.

Comparison of repair cost, per ton of steel produced, shows that in the same period the open hearths produced 100,603 net tons at an average repair cost of \$3.35 per net ton. The electric furnace produced 65,438 net tons at an average repair cost of \$2.65 per net ton.

Relining the electric furnace shell from power off to power on averages 12 hr. Most of this time is spent tearing out the old lining and cleaning out the furnace. It takes eight brickmasons about 3 hr to reline the furnace shell, including a new tap hole. Total cost averages \$5250. The spare roof ring is lined off the furnace. This requires six brickmasons about 8 hr with a total cost of \$1650. To change a furnace roof requires an average of 2½ hr.

A complete repair, excepting a new bottom, will cost about \$7000 and can be done in less than 16 hr. Atlantic Steel Co.'s experience indicates that costs are in favor of the electric furnace when making the same grades of steel in an all cold metal practice.

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