

Appendix A

Use of Ferrous Scrap

Other than the increased use of electric arc furnaces for steelmaking, which usually use ferrous scrap but which could also use direct reduced iron, the increased use of continuous casting is an effective way to increase the use of purchased prompt industrial and obsolete scrap.¹⁾ This new scrap consumption is based on increased yield and the maintenance of the original level of hot metal production (existing with ingot casting) and adequate downstream facilities. The increased yield leads to less home scrap which must be replaced by purchased scrap. Eventually much direct reduced iron could be used with scrap, although today this is not commercially feasible on a large scale.

The 1978 National Energy Conservation Policy Act established a means to set national targets for the use of recycled materials for the entire ferrous industry (including iron and steel making, foundries and ferroalloy production) the target now being considered for 1987 is 41% for purchased prompt industrial and obsolete scrap.

For the scenario of 50% continuous casting usage and a 12% increase in yield the approximate amount of increased purchased scrap would be 5,887,00 tons divided by an appropriate yield factor. If the latter is assumed to be 0.92, then the scrap requirement is 6,399,000 tons. For the base year of 1978 the purchased scrap for iron and steel making was 31,416,000 tons and the scrap utilization 32%. The new totals would then be 37,815,000 tons of scrap purchased and 103,822,000 tons of steel shipped. This signifies a new and substantially increased scrap

1) Direct reduced iron is made by a process which converts iron ore to solid pure iron without the need for blast furnaces and coke ovens. Also, there may be a slight decrease in scrap utilization in steelmaking furnaces when continuous casting is used. This is done to increase the temperature of the molten steel. However its effect is small compared to the noted increase in purchased scrap.

utilization of 36%.

If an increase in raw steelmaking capacity is also considered in order to satisfy a 2% per year increase in steel demand, as described previously and it is assumed that 50% of the additional steelmaking is in electric arc furnaces based on scrap usage, then the utilization rate becomes 42%.

All three of the above scrap utilization rates (32% for 1978, 36% with increased continuous casting, and 42% with increased continuous casting and expansion) are only for the iron and steel making segment of the ferrous industry. It is unclear whether at this or some later time the iron and steel making segment and individual companies would be asked on a voluntary basis, as is now the case, or would be required on a mandatory basis to meet the recycling target set for the entire ferrous industry. It should also be noted that the target is not set in the law. It is up to DOE to set and adjust the target according to various guidelines.

If the foundry segment which uses approximately 90% scrap is considered and the numerically small ferroalloy segment is omitted, then the three new scrap utilization rates for the entire ferrous industry (assuming a static foundry segment) are: 40% for 1978, 44% with increased continuous casting and 48% with increased continuous casting and expansion.

Thus, the current target of 41% for 1987 being considered by DOE has almost been met in 1978 and will almost certainly be met in 1979 due to the steadily increasing use of scrap based electric arc furnaces. The increased use of continuous casting, in any case, substantially increases the purchased scrap utilization rate for the

entire ferrous industry. However it should also be noted that the quality of the home scrap which is being eliminated by the increased continuous casting is very high. The greater use of prompt industrial and obsolete scrap introduces more alloying and impurity elements which can make the production of some steels more costly or even impossible. This is a negative consequence of both increased use of continuous casting and the Energy Conservation Act. This Act could also be a barrier to the development and use by integrated steel companies of coal based direct reduction of iron ore, the product of which is substitutable for and superior to scrap.

Additionally, both the Act and increased continuous casting usage stimulates integrated companies to use more purchased scrap and promotes scrap price increases. This effect could be quite negative for the smaller, totally scrap based electric furnace steel companies ("mini-mills"). Should this segment of the industry shrink because of such a profit squeeze and more steel then be produced by integrated companies, the net result would be less total purchased scrap and more energy consumed. But this upward pressure on prices will be minimized and perhaps eliminated if the smaller steel companies spur the use of direct reduction. Although this could reduce the percent use of purchased scrap, it would facilitate growth and expansion of these companies and eventually a net increase in both the total amount of scrap consumed and the amount of continuous casting in use.