Although it would have been possible for large, integrated U.S. mills to have constructed a number of small oxygen furnaces, there are two apparent reasons why it was not economically desirable for U.S. producers to do this. First, large producers undoubtedly determined that their large open-hearth furnaces were more efficient in producing large tonnages than a large number of small-capacity oxygen furnaces would be. This, of course, would not have precluded the very small U.S. producers from constructing small oxygen furnaces, since these producers did not have the same need for volume; generally, however, these *very small steel producers do not have blast furnaces*, which are a prerequisite to an oxygen steelmaking operation. A second reason by U.S. producers deferred making investments in oxygen furnaces is undoubtedly that they felt they could develop higher-capacity oxygen furnaces in the not-too-distant future and that such furnaces would be much more efficient than small-capacity furnaces, which were the only type that could have been built during this earlier time period. To make the oxygen furnace feasible for widespread use in the United States, a great deal of research and development first had to be undertaken; this was to come at a future date.

At present, some 300-ton oxygen furnaces are already in operation in the United States and others are being built, but the average-size oxygen furnace now in operation in the United States is about 140 tons. Until the large oxygen furnaces were developed, a number of companies adapted their large, modern open-hearth furnaces with oxygen lances and have operated them as efficient production units. In light of these facts, it seems quite apparent that there would have been little or no advantage to the major U.S. companies from oxygen furnaces, rather than continued use and improvement of the existing open hearths, during the years before the large oxygen furnaces were perfected.

The process of the introduction of the oxygen furnace is neither hit-or-miss nor one of massive replacement. Companies tend to replace the oldest and highest-cost open hearths first, and only replace those where capital could not be utilized more efficiently elsewhere. Now that 150- and 200-ton furnaces have been engineered, one company after another is building this type of capacity.

So long as steel produced by conventional methods can compete with that produced by newer technology, it would not be a wise economic decision to scrap the existing facilities and to destroy vast investments in fixed capital. It can be expected that newer technology will become more general as old facilities wear out and are scrapped. This is why it is unlikely that there will be any future purchase of *new* open-hearth capacity, but there will continue to be modifications, adaptations, and modernizations of such facilities so long as they are cost-competitive. Any decision that involves the contemplated scrapping of open hearths and their replacement by oxygen furnaces is carefully weighed against the alternative uses of funds.

Another aspect of technology that the authors discuss involves the use of continuous casting, a process made economically practical as a result of the oxygen furnace. Continuous casting at the present time involves an uninterrupted process of steelmaking and steel-forming of in-process shapes for future conversion. The authors again claim that the U.S. industry adopted the continuous-casting method slowly and only with great reluctance. But, once again, it is necessary to point out that the structure of steelmaking operations in the United States is very different from that in Europe, and that the size of the economical producing unit in the United States is much larger. Even in the United States, the mills that found it economical to adopt continuous-casting techniques at first were the smaller plants.

Although the authors do indicate that continuous casting abroad "began to move into high gear about eight years ago," they do not add that most of the 40 machines installed from 1955 to 1962 had very small capacities. Only 10 of the 40 had annual capacities in excess of 100,000 tons, and the largest was rated at about only 350,000 tons. This contrasts with modern blooming and slabbing mills (which they replace) in the United States that have annual capacities in excess of 3,000,000 tons.

Although it would have been possible for large, integrated U.S. producers to construct small continuous-casting units at an earlier date, such an approach would undoubtedly have resulted in higher unit costs. For the small producer, however, who could not produce the volume of steel necessary to make the operation of large-volume blooming, slabbing, and billet mills feasible, small capacity continuous-casting units were economical. Continuous casting was not installed by any large producers until a large-scale process was developed which