

# Method Used During Forced Interruptions In Open Hearth Operations

by George A. Ferris

***The Question: "How to shutdown a basic open hearth furnace for both known and varying lengths of time?" is one which operators are unfortunately too frequently called upon to answer.***

THE fact that many steelmakers answer this question differently indicates a rather wide divergence of opinion on the subject. Since all can not be right, a coalition of ideas might possibly lead to the one best method.

## **Questionnaires sent to open-hearth plants.**

Questionnaires were sent to 63 open hearth plants in the United States and Canada. Replies were received from 47 plants. Unfortunately, the results left considerable to the judgment of the person preparing the recapitulation, and did not as thoroughly cover such a diversified subject as might have been possible. Much of the detail requested on the questionnaire was ignored, and no attempt was made to group the total number of furnaces employing any particular shutdown method. Methods were, thus, categorized strictly on a shop basis, since it was recognized that each shop would use the method which they liked best, regardless of the number of furnaces involved.

The objective is to minimize hydration and to attempt to maintain a furnace that can be put back into operation in the shortest period of time. Nevertheless, it was evident from the questionnaires, that there was no particular correlation between the methods employed in shutting down and the types of refractories used in furnace construction.

## **Results of survey show one of four methods with innovations in general use.**

The tabulation of the survey indicated that one of four major methods of shutting down an open hearth furnace is generally followed, with some interesting innovations to each method.

**Method One:** Thirty-three of the 47 plants responding reported a practice of sealing up the furnace empty, with all dampers closed and no firing. Five of these 33 plants reported a practice of maintaining a gas fire up to one week. Two of these plants reported a practice of maintaining a gas fire on the furnaces with weak roofs up to one month. All of these 33 plants reported they would follow this general procedure regardless of the duration of the shutdown.

**Innovations to Method One include:**

a) Two plants reported a practice of coating the

bottoms with tar or pitch as the furnace cools, if the shutdown was for a prolonged period.

b) One plant reported a practice of spreading 2000 lb of coke over the hearth, and one plant reported a practice of spreading burned lime over the hearth.

**Method Two:** Four of the 47 plants responding reported a practice of sealing up the furnace empty, with all dampers closed and firing with gas to maintain temperatures up to 1500°F. With one exception, these four plants reported they would use this method for an indefinite period of time. The other plant reported they would discontinue the gas fire at the end of two weeks. Two of these four plants reported introducing the gas through the slag pocket bulkheads, while the other two plants introduced the gas over the hearth.

**Method Three:** Five of the 47 plants responding reported a practice of sealing up the furnace after a partial charge (limestone and scrap) was added. Two of these 5 plants reported a practice of maintaining a gas fire up to two weeks, and one of the five plants reported they would leave the furnace empty, if the duration of the shutdown was going to be more than one week. One of these five plants reported a practice of charging the furnace with limestone and scrap and melting the scrap down level before shutting fuel off. This particular plant reports holding furnaces in this manner up to one year without difficulty.

**Method Four:** Five of the 47 plants responding reported a practice of sealing up the furnace after a wet charge was added (scrap-limestone-ore-hot metal), and firing with gas for periods up to one month. One of these five plants reported that with this practice they fire the furnace until after the slag flush, then cut off the fuel and seal the furnace. All five plants reported they would use this method for periods between one week and a month. For known periods of longer duration they would leave the furnace empty.

## **Some shutdown methods adapt themselves more readily to flexibility.**

Frequently, periods of shutdown are not too firmly fixed, and some of the shutdown methods described adapt themselves to flexibility more readily than others.

At Ford's open hearth plant, the wet soaker is preferred, with the furnace sealed up and kept warm with a gas fire. Such a practice would be employed for periods up to one month. Experience of sealing up the empty furnace and keeping warm with gas for a period of two weeks resulted in decomposition of the bottom; this was attributed to the moisture content of the gas. The use of dehumidifiers and better methods of sealing are worth considering.

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